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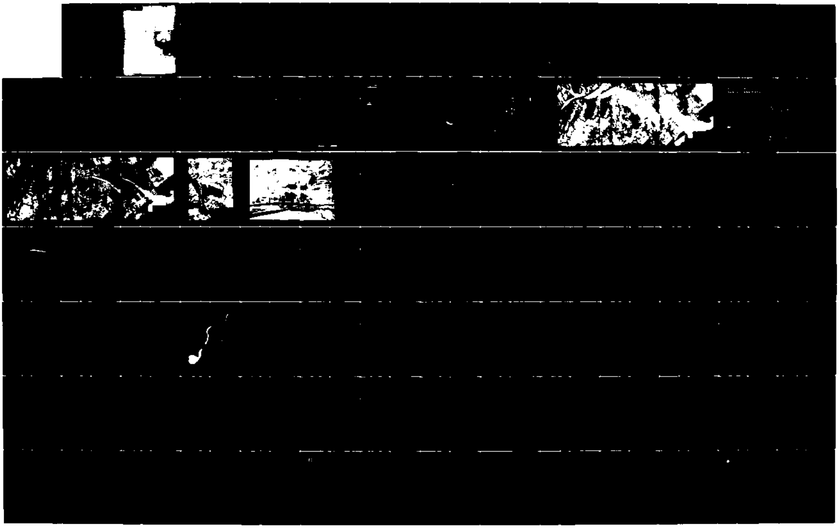

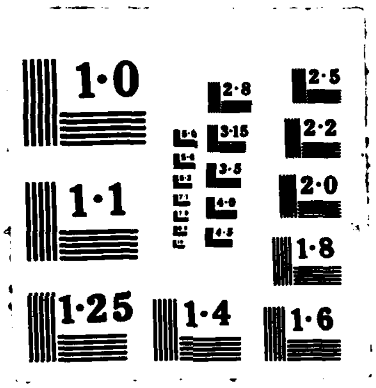
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Final Detailed Project Report for Flood Control and Allied Purposes

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Studies performed for this reprot were intended to identify water resources needs of the study area, todevelop alternative solutions to the problems and needs identified, and to select a flood control plan that maximizes benefits to the surrounding community within the guidelines established by federal laws and policies.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

SOUTH FORK
OF THE
SANTA CLARA RIVER
SANTA CLARITA VALLEY, CALIFORNIA

MAIN REPORT

FINAL SUPPLEMENT
TO
DETAILED PROJECT REPORT FOR FLOOD CONTROL
AND
FINAL ENVIRONMENTAL ASSESSMENT

JANUARY 1985

SYLLABUS

This Supplemental Detailed Project Report concerns the South Fork of the Santa Clara River. The main stem of the South Fork flows generally northward for a distance of about 6 miles through unincorporated areas in the Santa Clarita Valley in northern Los Angeles County before it joins the Santa Clara River.

Flooding is the major water resource-related problem in the study area. The existing temporary flood control channel provides only about 5-year protection to the residents along the South Fork.

This report is a supplement to the Final Detailed Project Report (DPR) dated January 1983. The DPR recommended a plan that included a deposition area and 0.8 miles of concrete channel. The land selected for the deposition area is located just downstream of I-5, where an existing mule farm now exists. Subsequent to the Final DPR, the local sponsor, the Los Angeles County Flood Control District, requested a design change. Acquisition of rights-of-way for the deposition area had become too cost prohibitive. The County therefore suggested going back to a plan similar to Plan A that was recommended in the 1976 Feasibility Study. The plan consists of a debris basin upstream of I-5 at the junction of Towsley and Wiley Canyons rather than a deposition area downstream of I-5.

The plan recommended herein (plan A) is economically justified, provides Standard Project Flood protection, and is strongly supported by the local sponsor. The selected plan consists of a debris basin upstream of I-5 that outlets via a spillway into 1.2 miles of rectangular concrete channel. Also included is the construction of seven bridges and the raising of the existing channel walls downstream of Lyons Avenue to SPF levels.

The Corps recommends, subject to certain conditions of non-Federal cooperation as outlined in this report, that the proposal for flood control be approved for construction. The total cost of the plan, in August 1984 dollars, is estimated at $11,391,000. The Federal share of the estimated cost is $4,000,000, and the non-Federal share would be $7,391,000, of which $4,675,000 is for construction and $2,716,000 is for easements, rights-of-way, and relocations.

Annual charges for the recommended plan are estimated at $1,043,000. Annual benefits are estimated at $1,107,000 and the benefit-to-cost ratio is 1.1. Following construction, non-Federal interests would be required to operate and maintain all project features. Included in the annual charges are annual operation and maintenance costs, currently estimated at $85,000.

It should be noted that on January 1, 1985, the Los Angeles County Flood Control District (local sponsor) was reorganized under County government, and is now officially referred to as the County of Los Angeles Department of Public Works. For the purpose of consistency throughout this report, however, reference will still be made to the Los Angeles County Flood Control District.

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INTRODUCTION

This supplemental report was prompted by a request from the local sponsor, the Los Angeles County Flood Control District, for a design change to the plan recommended in the Final Detailed Project Report (DPR) dated January 1983. The requested change is to recommend a plan similar to the one previously studied and recommended in the 1976 Feasibility Study (Plan A). It consists of locating a debris basin at the junction of Towsley and Wiley Canyons, upstream of Interstate 5, rather than a debris deposition area downstream of Interstate 5.

This change was brought about by the increasing political and financial pressures in acquiring rights-of-way for the parcel that was to be used for the deposition area in the previously recommended plan. The Los Angeles County Flood Control District considers acquisition of this parcel too cost-prohibitive and desires implementation of Plan A, (see Appendix A, Exhibit 1).

The main objective of this report is to document the modifications required to make the design change. This report is a supplement to the Final Detailed Project Report, and as such, presents that material needed to document and support the revised project. For more detailed discussion of project background and alternative solutions, please refer to the Final DPR.

AUTHORITY

In an attempt to reduce flood damage along the South Fork of the Santa Clara River, the Los Angeles County Flood Control District requested that a study be accomplished under the Continuing Authority of Section 205 of the 1948 Flood Control Act, as amended (Small Project).

PURPOSE

The purpose of the overall South Fork of the Santa Clara River study is to determine the flood control and water resources needs of the area, and to recommend an implementable plan for meeting these needs. The purpose of this Supplemental Detailed Project Report is to make a design change to the plan recommended in the Final DPR dated January 1983 as requested by the Flood Control District. This report presents the new plan, Environmental Assessment, and technical appendixes to document and support the change.

SCOPE OF THE STUDY

The South Fork of the Santa Clara River originates in the Santa Susanna Mountains and flows generally northward to its confluence with the main stem of the Santa Clara River. This report is principally concerned with water-related problems in the 298-acre, highly-developed area within the Standard Project Flood (SPF) plain along a 3-mile reach of the South Fork. This reach extends from the junction of Wiley and Towsley Canyons downstream to the end of the existing flood control improvements near the junction with Newhall and Placerita Creeks (see Plate 1). Studies were conceived and performed to provide information to determine functionality and justification, and to permit selection of a plan of action to meet the needs of the people involved. Detailed evaluations of the economic, engineering, social, and environmental effects of the recommended plan were made before selecting it.

PROJECT HISTORY

In December of 1971, an "Interim Review Report for Flood Control, Newhall, Saugus, and Vicinity, Santa Clara River and Tributaries", was prepared by the District Engineer. As a result of the report, it was decided with the Los Angeles County Flood Control District, that the Army Corps of Engineers, LAD, would study improvements to a portion of the tributaries including the South Fork of the Santa Clara River, and the LACFCD would be responsible for improving other tributaries including Newhall Creek and Placerita Creek.

Subsequently, a Feasibility Report for Flood Control and Recreational Development of the South Fork of the Santa Clara River was completed in July, 1976. The report recommended a debris basin upstream of Interstate 5 leading into about 1.2 miles of channel. Following the 1976 report, the Los Angeles County Flood Control District determined that rights-of-way acquisition for the debris basin upstream of Interstate 5 would be too cost prohibitive due to a residential development that had been planned for the area. The Flood Control District requested a restudy to determine if, instead, a debris deposition area would be feasible at a location just downstream of I-5. Subsequently, a Detailed Project Report for the South Fork of the Santa Clara River was completed in January of 1983. The 1983 DPR presented the results of the restudy and recommended construction of a debris deposition area just downstream of I-5 followed by a 0.8 mile-long concrete channel.

Following the completion of the DPR, the County requested the design change reported herein. The change consists of returning to the plan presented in the 1976 Feasibility Report, that is, having a debris basin upstream of I-5 (Plan A). During the years between the two reports, private plans for developing the upstream area for residences were abandoned, thereby allowing less expensive acquisition of rights-of-way than previously existed. Conversely, the area recommended for a debris deposition area downstream of I-5 became politically and financially less desirable for use as a flood control feature.

PREVIOUSLY CONSIDERED ALTERNATIVES

Four structural, five combination structural-nonstructural solutions, and two nonstructural solutions were considered for the South Fork in the January 1983 Final Detailed Project Report. They are listed and briefly described here. For more detailed discussion of the alternatives, and the criteria that they must meet, please refer to the Final Detailed Project Report dated January 1983.

STRUCTURAL ALTERNATIVES

Plan A. A concrete channel with a debris basin at the junction of Wiley and Towsley Canyons to protect against the Standard Project Flood.

Plan B. A concrete channel with a debris basin at the junction of Wiley and Towsley Canyons to protect against the 100-year flood.

Plan C. An earth-bottom channel with debris basin to protect against the 100-year flood.

Plan D. An earth-bottom and concrete channel with debris basin to protect against the 100-year flood.

Plan F. A concrete channel and retention dam to protect against the Standard Project Flood.

COMBINATION OF STRUCTURAL AND NONSTRUCTURAL ALTERNATIVES

Plan E-1. An open area and concrete channel with debris basin to protect against the Standard Project Flood.

Plan E-2. An open area and concrete channel with debris basin to protect against the 100-year flood.

Plan E-3. A debris deposition area downstream of I-5 and concrete channel to protect against the Standard Project Flood. This was the plan recommended in the Final DPR dated January 1983.

Plan E-4. A debris deposition area downstream of I-5 and concrete channel to protect against the 100-year flood.

NONSTRUCTURAL ALTERNATIVES

Plan G. Flood plain management to protect against the 100-year flood.

NO-ACTION ALTERNATIVE

No Federal involvement or assistance in solving the flood problem.

RECOMMENDED PLAN MODIFICATIONS

The previously recommended plan (Plan E-3) would be changed by extending the channel upstream of Interstate 5; and creating a debris basin upstream of I-5 instead of a debris deposition area downstream of I-5. As such, the recommended plan would be configured much like the Plan A of previous reports and will therefore be referred to as Plan A. The recommended plan would provide a high level of flood protection and would consist of (1) a debris basin at the junction of Towsley and Wiley Canyons; (2) a rectangular concrete channel 600 feet long, 25 feet wide, and 9 feet deep from the downstream end of the debris basin spillway to The Old Road crossing; (3) a rectangular concrete channel 1.2 miles long, 28 to 38 feet wide and 11 to 15.5 ft. deep from Calgrove to Lyons Avenue, designed for a discharge of 12,000 to 13,000 cfs; and (4) raising the walls of the existing flood control channel to the SPF level of protection. The existing earth-bottom channel has concrete lined slopes, a base width of 140 feet and a depth from 12 to 16 feet. Bridges would be needed at De Wolfe Road and Atwood Boulevard and Lyon's channel to replace the existing dip crossings. Bridges would also be built where the new route of Wiley Canyon Road crosses the channel 2100 feet downstream of I-5 and

where it crosses Lyon Canyon channel (see Plate 4). Additionally, a crossing would be added at the end of the spillway, and the Calgrove Boulevard bridge would be reconstructed.

CHANGES IN SCOPE OF PROJECT

The design capacity of Plan A, as compared to the previously recommended Plan E-3, has not changed; the level of protection remains at Standard Project Flood.

CHANGES IN PROJECT PURPOSE

The project purpose has not changed. It remains the same, that is, to provide flood control.

CHANGES IN LOCAL COOPERATION REQUIREMENTS

The local sponsor, the Los Angeles County Flood Control District, is strongly in favor of this project. In order to maintain the construction start of Spring 1985 identified in the Final DPR, the County has agreed to aid in the design efforts during the Plans and Specifications phase of the project,(see Appendix A, Exhibit 2).

CHANGES IN LOCATION OF THE PROJECT

The only shift in project location is that the deposition area located east of Interstate 5 in plan E-3 has been changed to a debris basin west of I-5 at the confluence of Towsley and Wiley Canyon Creeks.

DESIGN CHANGES

The major design changes are (1) location of a debris basin west of Interstate 5 at the junction of Towsley and Wiley Canyons, instead of placing a deposition area downstream of I-5; (2) construction of a channel from the downstream end of the debris basin spillway to The Old Road Crossing; (3) incorporation and/or replacement of the existing concrete channel and culverts between the debris basin site and the downstream end of the freeway; and (4) extending the inside walls of the existing I-5 triple box culvert upstream around the curve to get a better distribution of flow before entering the freeway culvert.

CHANGES IN PROJECT ECONOMICS

An economic comparison of Plans A and E-3 may be found in Table 1. The table also displays the National Economic Development (NED) Plan which is currently Plan B. These costs differ from the financial costs shown in Table 2, due to the inclusion of interest during construction, and the exclusion of funds used to complete the Detailed Project Report.

It should be noted that Plans A and E-3 continue to be economically justified. Additional bridge costs, and an increase in right-of-way costs, has resulted in Plan E-3 having lower net benefits than reported in January 1983. Similarly, an increase in the value of land has resulted in an increase in location benefits and therefore net benefits for Plan A.

Table 1. Comparison of Changes in Project Economics. (Thousands of August 1984 Dollars, 8-3/8%, 100-Year Project Life)

	Plan A	Plan B (NED Plan)	Plan E-3
FIRST COSTS			
Construction	8,215	7,203	5,060
Interest During Construction	504	448	155
Relocations, Bridges	1,150	1,150	1,240
Rights-of-Way	1,566	1,540	1,550
Mitigation	102	102	0
TOTAL FIRST COST	11,435	10,443	8,005
ANNUAL CHARGES			
Interest and Amortization	958	875	671
Operation, Maintenance, & Repair (flood control)	80	80	70
Operation, Maintenance, & Repair (mitigation)	5	5	0
TOTAL ANNUAL CHARGES	1,043	960	741
ANNUAL BENEFITS			
Damages Prevented	705	673	706
Reduced Channel Maintenance	50	50	45
	34	34	0
Location Benefits	318	318	0
TOTAL ANNUAL BENEFITS	1,107	1,075	751
B/C FUTURE CONDITION	1.1	1.1	1.01
NET BENEFITS	64	115	10

ENVIRONMENTAL CONSIDERATIONS IN RECOMMENDED CHANGES

There will be some negative environmental impacts on the project area resulting from the construction of Plan A. The construction of a debris basin at the junction of Towsley and Wiley Canyons would eliminate about 1.8 acres of grassland habitat, about 0.5 acres of riparian habitat, and would disturb about 4.5 acres of oak-walnut habitat. In addition, construction of a concrete channel downstream of the basin would cause the loss of 1.5 acres of riparian habitat and 2 acres of prime and unique farmland.

Mitigation measures for the revised plan include the maintenance and preservation of about 8.3 acres of riparian, 2.7 acres of walnut woodland, and 3.5 acres of coastal sage habitat within project right-of-way adjacent to and upstream of the debris basin, and installation of nest boxes. Following construction, these measures will be monitored for two years by the Los Angeles County Flood Control District. This mitigation package was developed by the Corps of Engineers in coordination with the U.S. Fish and Wildlife Service, the California Department of Fish and Game, and the Los Angeles County Flood Control District.

RATIONALE FOR RECOMMENDING PLAN A

Plan A is recommended over Plan E-3, the previously recommended plan, and Plan B, the national economic development (NED) plan. It offers a high level of protection, and is highly favored by the local sponsor, as well as local residents.

Although Plan A would not maximize NED,it would increase NED values significantly by controlling future flood damages, both direct and indirect. By comparison, Plan A would improve national economic efficiency by $64,000 as compared to $115,000 for Plan B (NED). However, Plan B fails to offer the level of flood protection desired by the County, while Plan A does.

Once economically and politically favorable, Plan E-3 is now neither, due to increased costs of rights-of-way required for it. By comparison, Plan A offers higher net benefits and a higher B/C ratio.

Selection of Plan A is also consistent with the Corps' practice of providing a high level of protection for urban areas. The characteristics of flooding in the area are such that SPF protection is judged to fulfill the requirement of adequacy. These characteristics include short warning times of 10-40 minutes; flooding, debris deposition, and time consuming interruption of traffic on Interstate 5--the main north/south artery for the delivery of goods and services; and the land-locked nature of several of the streets in the flood plain. This last characteristic has particular relevance to the likelihood of loss of life; emergency access and egress is impossible on several streets due to flooding.

The area to be protected by the recommended plan contains a public elementary school that would be imminently endangered by floodflows. Other public services that would be endangered include areas of community recreation activities, markets, and the main transportation artery for goods and services between northern and southern California.

Since the Federal Government is currently limited to $4 million in expenditures for projects recommended under the Section 205 Authority, implementation of the recommended plan rather than the NED plan would not result in additional Federal expenditures. The additional local cost between the two plans, totaling $936,000, would be willingly paid by the local sponsor for the additional protection that Plan A would offer (see Appendix A, Exhibit 2).

IMPLEMENTATION RESPONSIBILITIES

Legislative and administrative policies have established the basis for the division of Federal and non-Federal responsibilities in the construction and operation and maintenance of Federal water resource projects.

COST ALLOCATION

All monies allotted for this project are required for the purpose of flood control.

COST APPORTIONMENT

Federal legislation pertaining to local protection projects requires that local interests provide all necessary rights-of-way, bear the expense of all relocations, and maintain and operate all features of the project after construction. However, because the project is being pursued under the Small Project Authority, the Federal share for construction costs, which includes all study costs, cannot exceed the current Federal limit of $4,000,000.

Table 2 shows the apportionment of the first costs between Federal and non-Federal interests for the selected plan. These costs differ from the costs used to compute the benefit-cost ratio (referred to as the economic cost) due to the inclusion of the funds used to complete the Detailed Project Report, and the exclusion of interest during construction figures.

Table 2. Cost Apportionment.
(August 1984 dollars)

Item	First cost	Federal share	Non-Federal share
Flood control			
Construction	$8,675,000 *	$4,000,000	$4,675,000
Relocations & Utilities	1,150,000	0	1,150,000
Rights-of-way	1,566,000	0	1,566,000
Total	$11,391,000	$4,000,000	$7,391,000

*includes $460,000 for Detailed Project Report (pre-authorization studies)

FEDERAL RESPONSIBILITIES

The Federal share of the estimated total first cost of the project is $4,000,000.

In addition to its financial responsibilities, the Federal Government would design and prepare detailed plans and administer contracts for the construction of the project after authorization of funding and receipt of

non-Federal assurances. In order to maintain the construction start date of spring 1985, the Los Angeles County Flood Control District will assist in the design effort during the plans and specifications phase of the project.

NON-FEDERAL RESPONSIBILITIES

The local sponsor for the project is the Los Angeles County Flood Control District. This agency was officially renamed the County of Los Angeles Department of Public Works on January 1, 1985. For the purpose of consistency throughout this report, however, reference will still be made to the Los Angeles County Flood Control District. As the local sponsor, they requested the design change recommending Plan A, and strongly support it as well, (see Appendix A, Exhibits 1 and 2).

Requirements of local cooperation are:

1. Provide without cost to the United States all lands, easements, and rights-of-way, including suitable borrow and spoil disposal areas, necessary for construction of the project.

2. Where Federal costs for the entire project exceed the limitation expressed in Section 205 of the 1948 Flood Control Act (PL 80-858) and its amendments, provide a cash contribution for the amount of the excess. See Table 2.

3. As made necessary by construction, accomplish, without cost to the United States, all alterations and relocations of buildings, transportation facilities, storm drains, utilities, and other structural and improvements. This provision excludes railroad bridges and approaches, and facilities necessary for the normal interception and disposal of local interior drainage at the line of protection.

4. Maintain and operate all the work after completion in accordance with regulations prescribed by the Secretary of the Army, at an annual cost now estimated at $85,000.

5. Prescribe and enforce regulations to prevent obstruction or encroachment of flood control works that would reduce their flood-carrying capacity or hinder maintenance and operation, and control development in the project area to prevent an undue increase in the flood damage potential.

6. Publicize flood plain information in the areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the flood plain.

7. Hold and save the United States free from damages including water rights claims caused by construction, operation, and maintenance of the project, excluding damages that are due to the fault or negligence of the United States or its contractors.

A letter from the Los Angeles County Flood Control District supporting the project and agreeing to provide all items listed above as required of the local cooperating agency is included in Appendix A (Exhibit 2). Prior to start of construction, the Los Angeles County Board of Supervisors would be required to enter into an agreement with the Federal Government that it would comply with Section 221 of the Flood Control Act of 1970, Public Law 91-611. A draft of the 221 agreement is inclosed in Appendix A.

CONCLUSIONS

This report is a supplement to the Final Detailed Project Report for the South Fork of the Santa Clara River, dated January, 1983. This study was prepared under the continuing authority of Section 205 of the 1948 Flood Control Act.

This report documents the viability of making changes to the plan recommended in the Final Detail Project Report dated, January 1983. The changes consist of placing a debris basin at the junction of Towsley and Wiley Canyons rather than a deposition area downstream of I-5. The changes were requested by the local sponsor when it became apparent that acquisition of the rights-of-way for the deposition area would be cost-prohibitive.

In evaluating the design changes, economic justification, environmental effects, social effects, degree and completeness of protection, and implementability were considered. The revised plan offers positive net benefits, as well as Standard Project Flood protection, mitigates for enivornmental effects, and has the support of the local sponsor.

The revised plan begins with a debris basin at the junction of Towsley and Wiley Canyons and leads into 1.4 miles of rectangular concrete channel. Included as part of the plan is the construction of seven bridges and the raising of existing channel walls downstream of Lyons Anvenue to SPF levels. The total cost of the plan in August 1984 dollars, is estimated at $11,391,000. The Federal share of the estimated cost would be $4,000,000 and the non-Federal share would be $7,391,000, of which $4,675,000 is for construction and $2,716,000 is for easements, rights-of-way, and relocations.

Annual charges for the recommended plan are estimated at $1,043,000; annual benefits are estimated at $1,107,000; and the benefit to cost ratio is 1.1. Following construction, non-Federal interests would be required to operate and maintain all project features. Annual operation and maintenance costs are currently estimated at $85,000.

The local sponsor of the project is the Los Angeles County Flood Control District.

RECOMMENDATIONS

Pursuant to Section 205 of the 1948 Flood Control Act as amended, I recommend approval for construction of the selected plan for flood control described in this report. The first cost is now estimated at $11,391,000. The Federal share of the estimated cost would be $4,000,000 under current authorities and policies.

DENNIS F. BUTLER
Colonel, CE
Commanding

LINE NO	UNIFORM COST CLASSIFICATION	FEATURE ITEMS	PROJECT COST ESTIMATE	TOTAL AS OF
1	06	Fish & Wildlife Facilities (Mitigation)	102,000	
2	09	Channel & Debris Basin Construction	7,355,000	
3	30	Engineering and Design	310,000	
4	31	Supervision & Administration	447,000	
5				
6		TOTAL DESIGN & CONSTRUCTION	8,215,000	
7				
8				
9	01	Land Easements & Rights-of-way	1,566,000	
10	02	Utilities Relocations	100,000	
11		Bridges	1,050,000	
12				
13				
14		TOTAL PROJECT FIRST COST	10,931,000	
15				
16	30	Detailed Project Report	460,000	
17				
18		TOTAL FLOOD CONTROL COST (FEDERAL)	4,000,000	
19				
20		TOTAL FLOOD CONTROL COST (NON-FEDERAL)	7,391,000	
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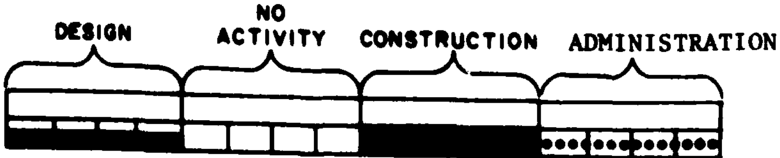
FUNDS IN THOUSANDS OF DOLLARS



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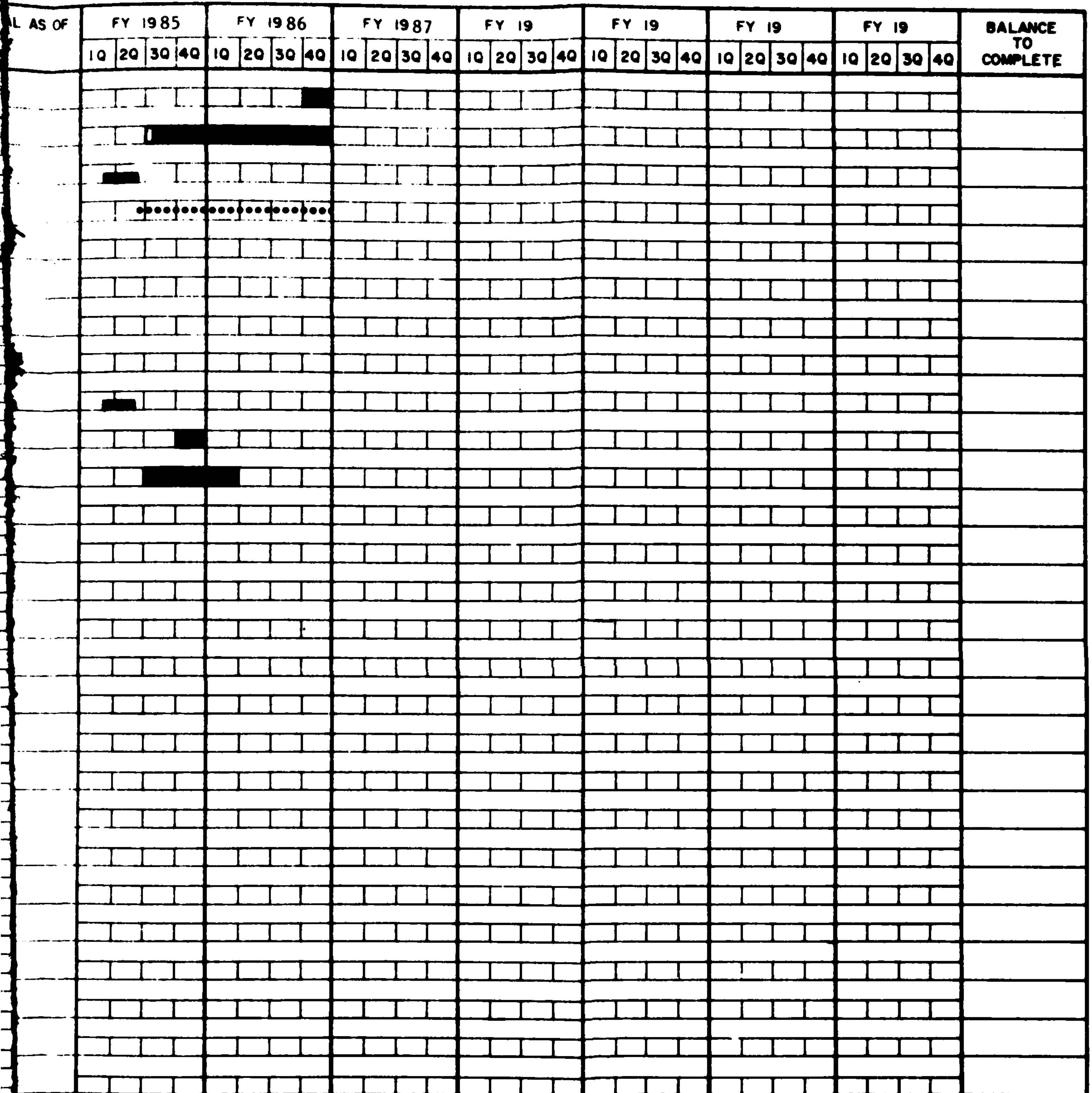

SOUTH FORK - SANTA CLARA RIVER

DESIGN AND CONSTRUCTION SCHEDULE

U.S. ARMY ENGINEER DISTRICT

LOS ANGELES, CORPS OF ENGINEERS

TO ACCOMPANY DESIGN MEMORANDUM NO.

DATED NOVEMBER, 1984 SHEET 1 OF 1

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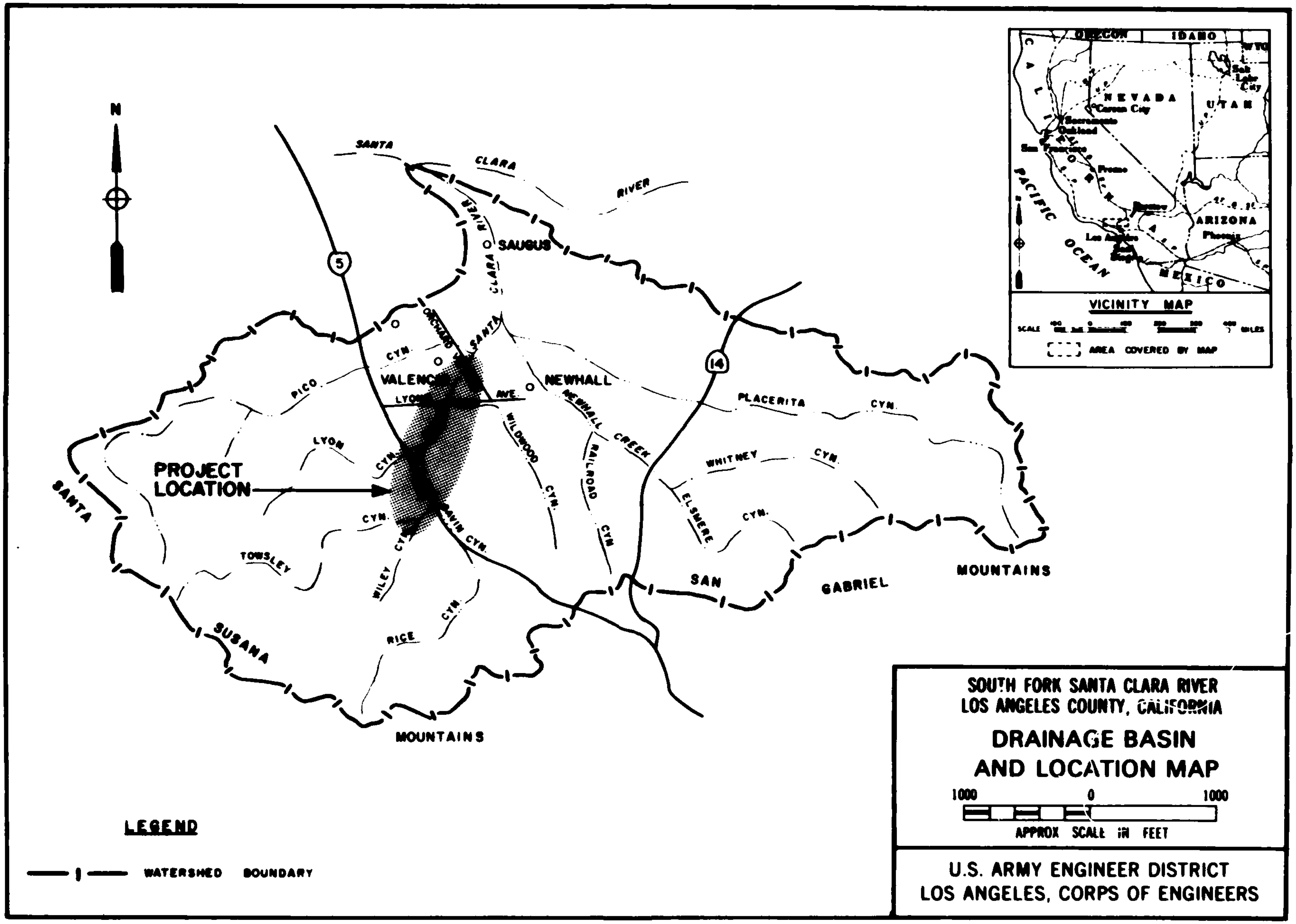

SOUTH FORK SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA

DRAINAGE BASIN
AND LOCATION MAP

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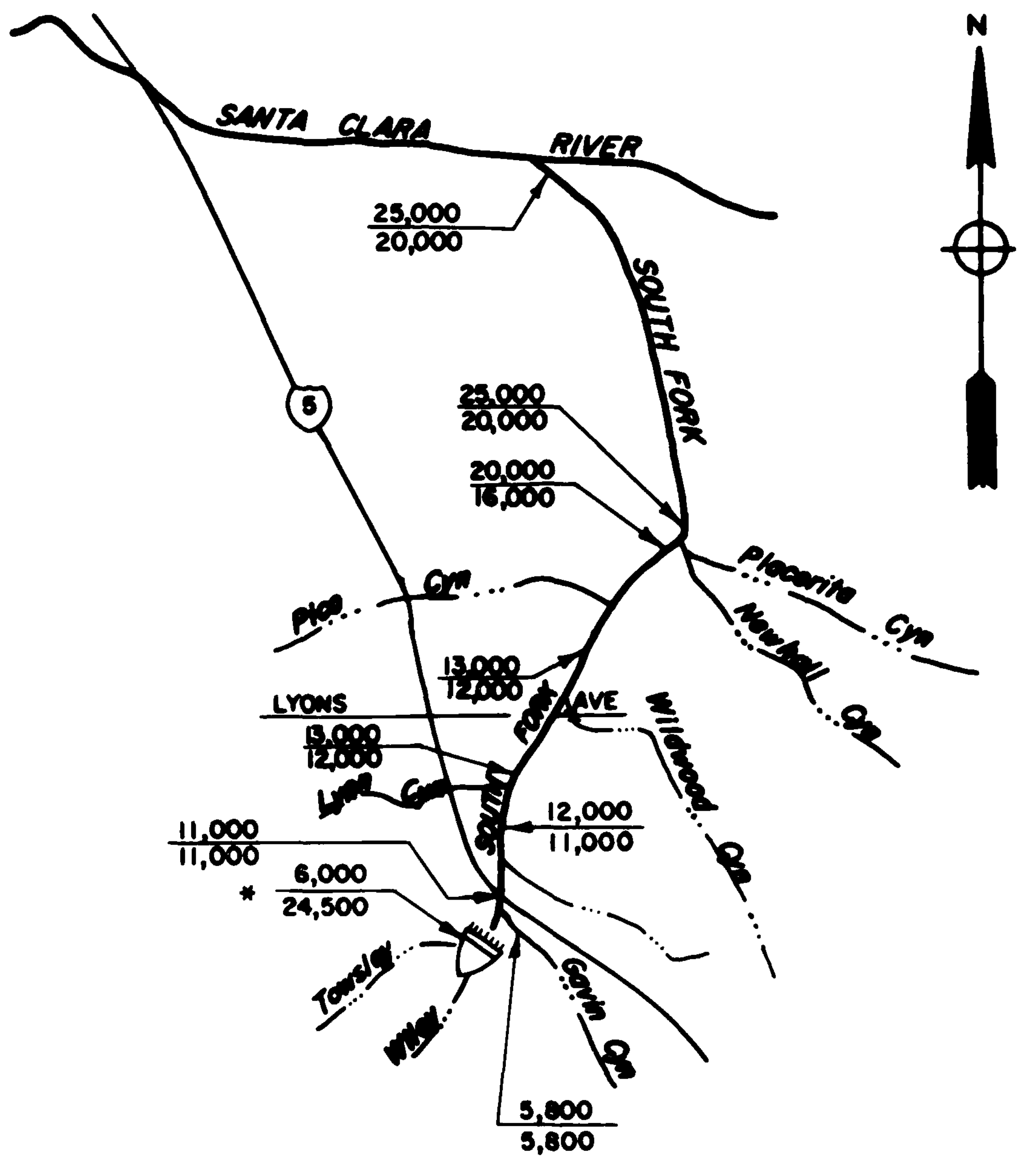
APPROX SCALE IN FEET

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

PLATE 1



LEGEND

12,000 — STANDARD PROJECT FLOOD IN CFS, FUTURE CONDITIONS
11,000 — STANDARD PROJECT FLOOD IN CFS, PRESENT CONDITIONS

DEBRIS BASIN

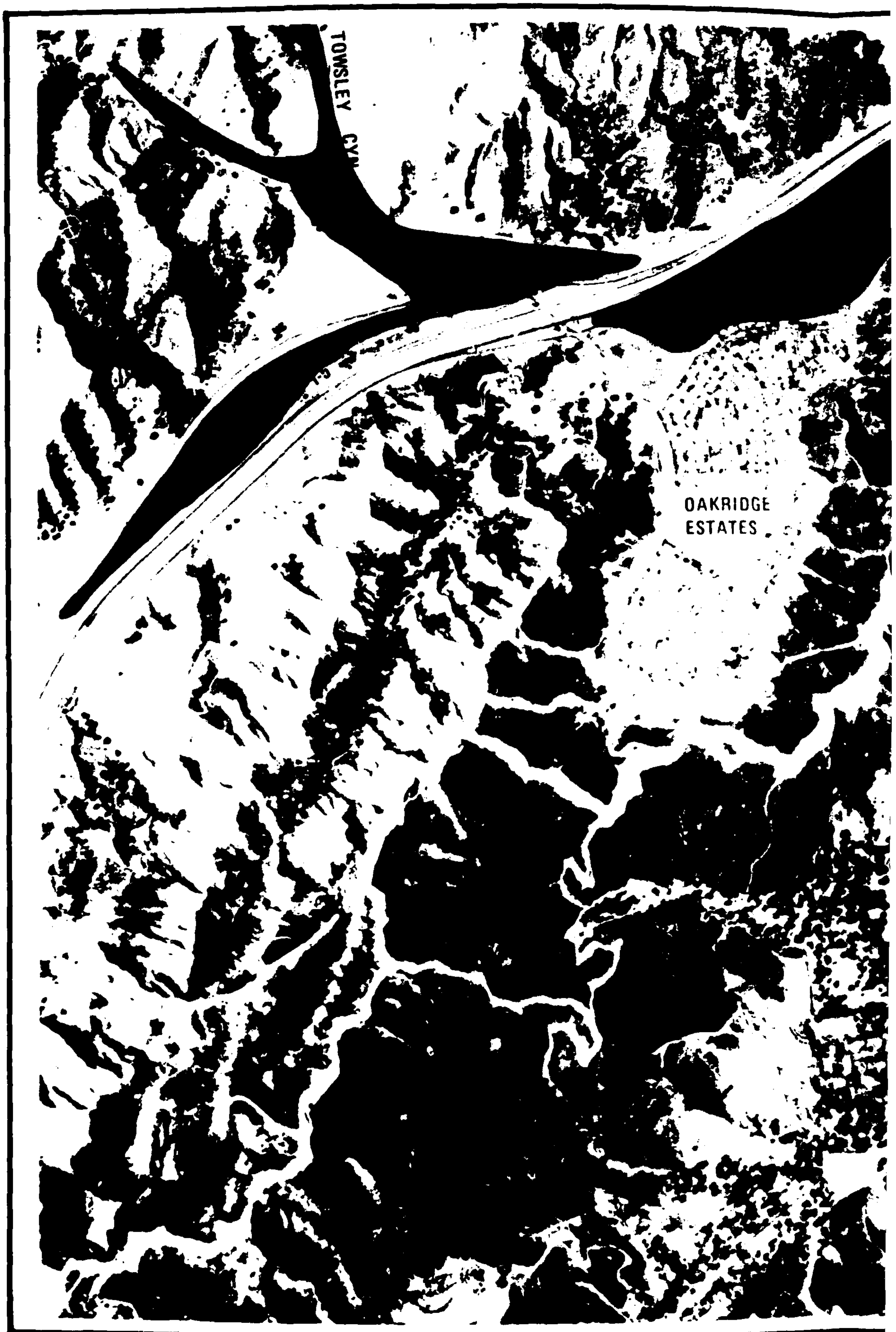
* — STANDARD PROJECT FLOOD PRESENT AND FUTURE COND. / PROBABLE MAXIMUM FLOOD

NOT TO SCALE

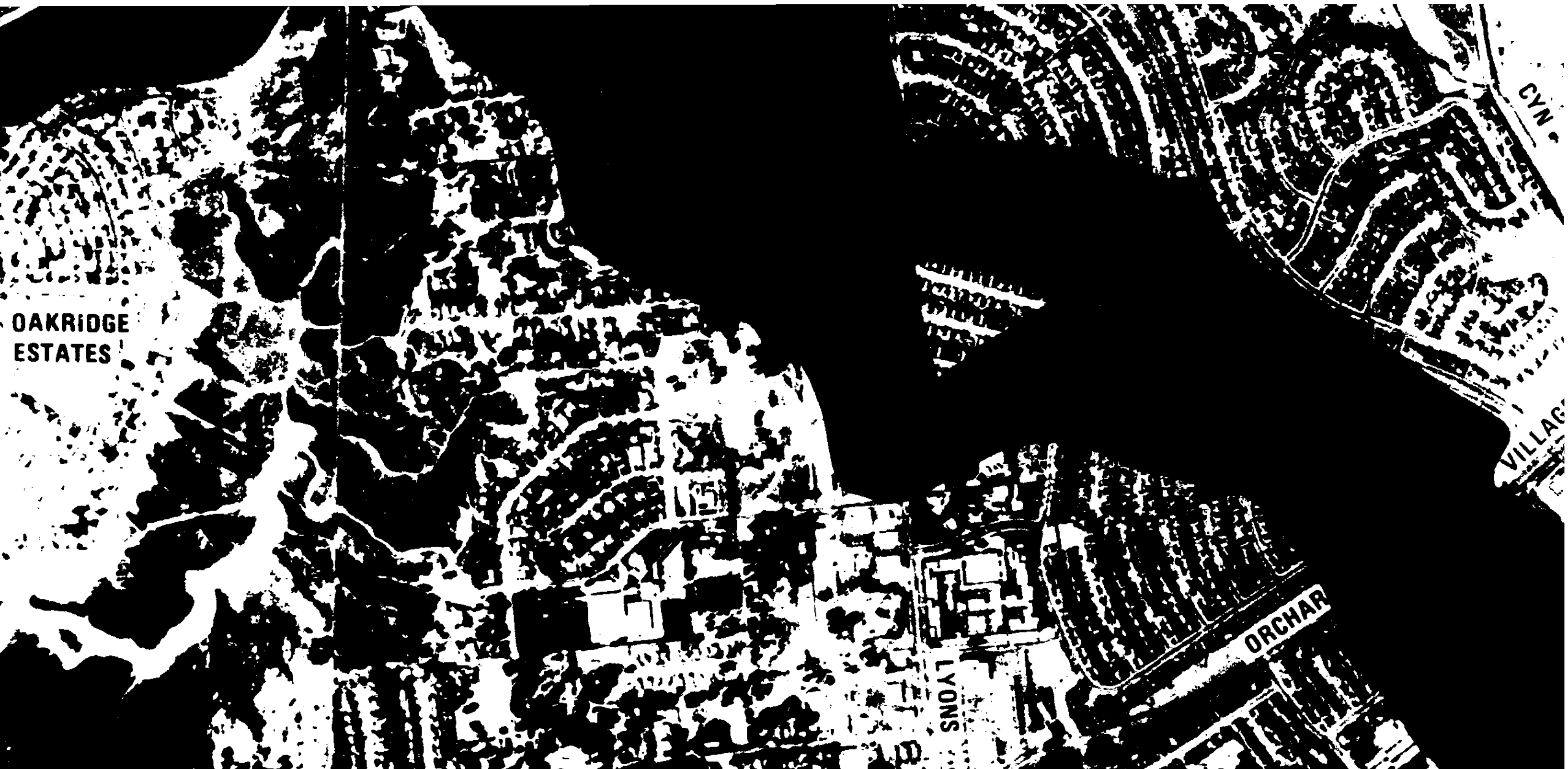
SOUTH FORK SANTA CLARA RIVER

STANDARD PROJECT FLOOD PEAK DISCHARGES

U S ARMY CORPS OF ENGINEERS
LOS ANGELES, DISTRICT



TOWSLEY CYN
OAKRIDGE
ESTATES


OAKRIDGE
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NEWHALL
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NEWHALL

1

2

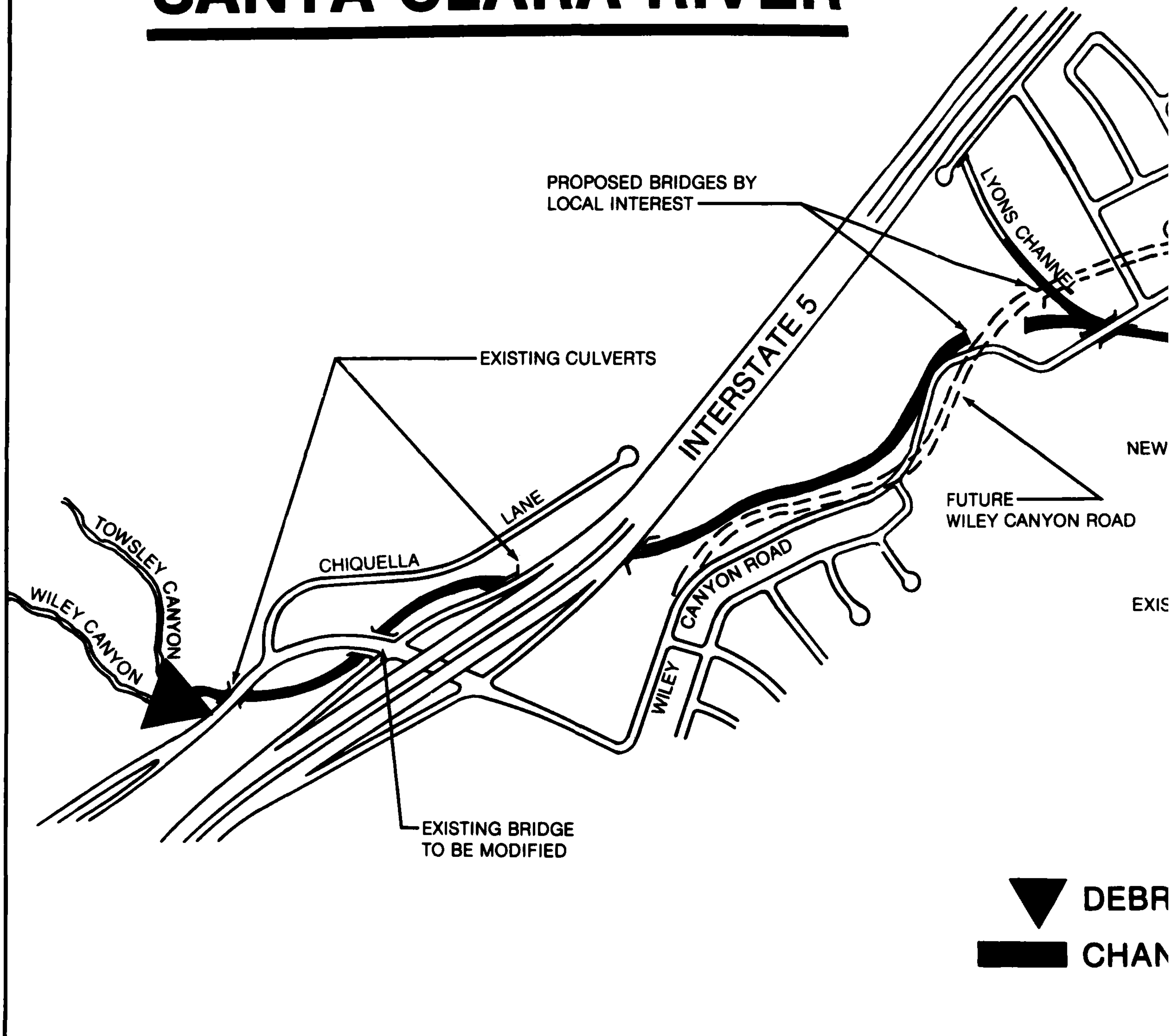
SOUTH FORK SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA

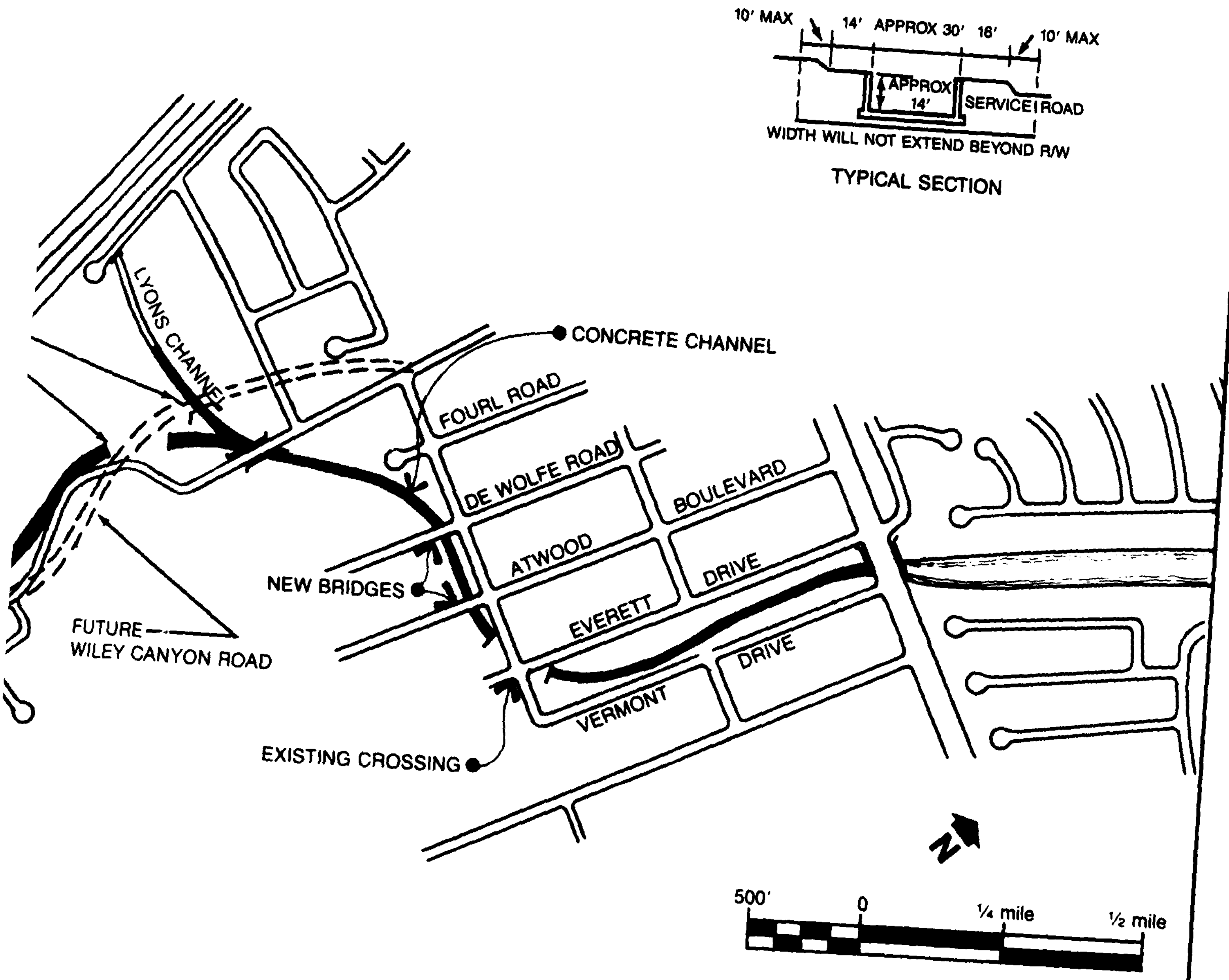
EXISTING CONDITION
OVERFLOW MAP
STANDARD PROJECT FLOOD

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 3

SOUTH FORK OF THE SANTA CLARA RIVER





▼ DEBRIS BASIN

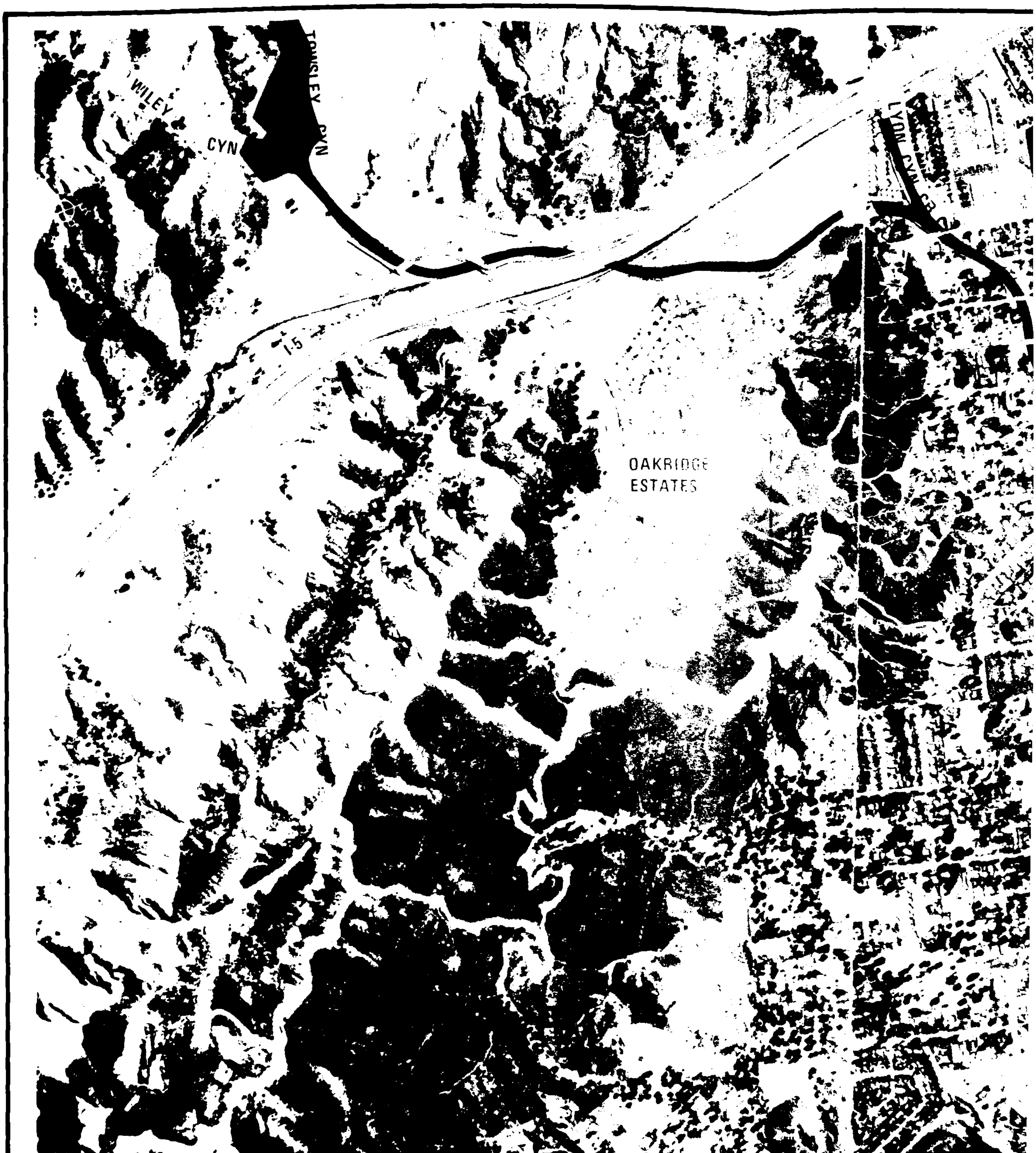
▬ CHANNEL IMPROVEMENT

SOUTH FORK SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA

SELECTED
PLAN

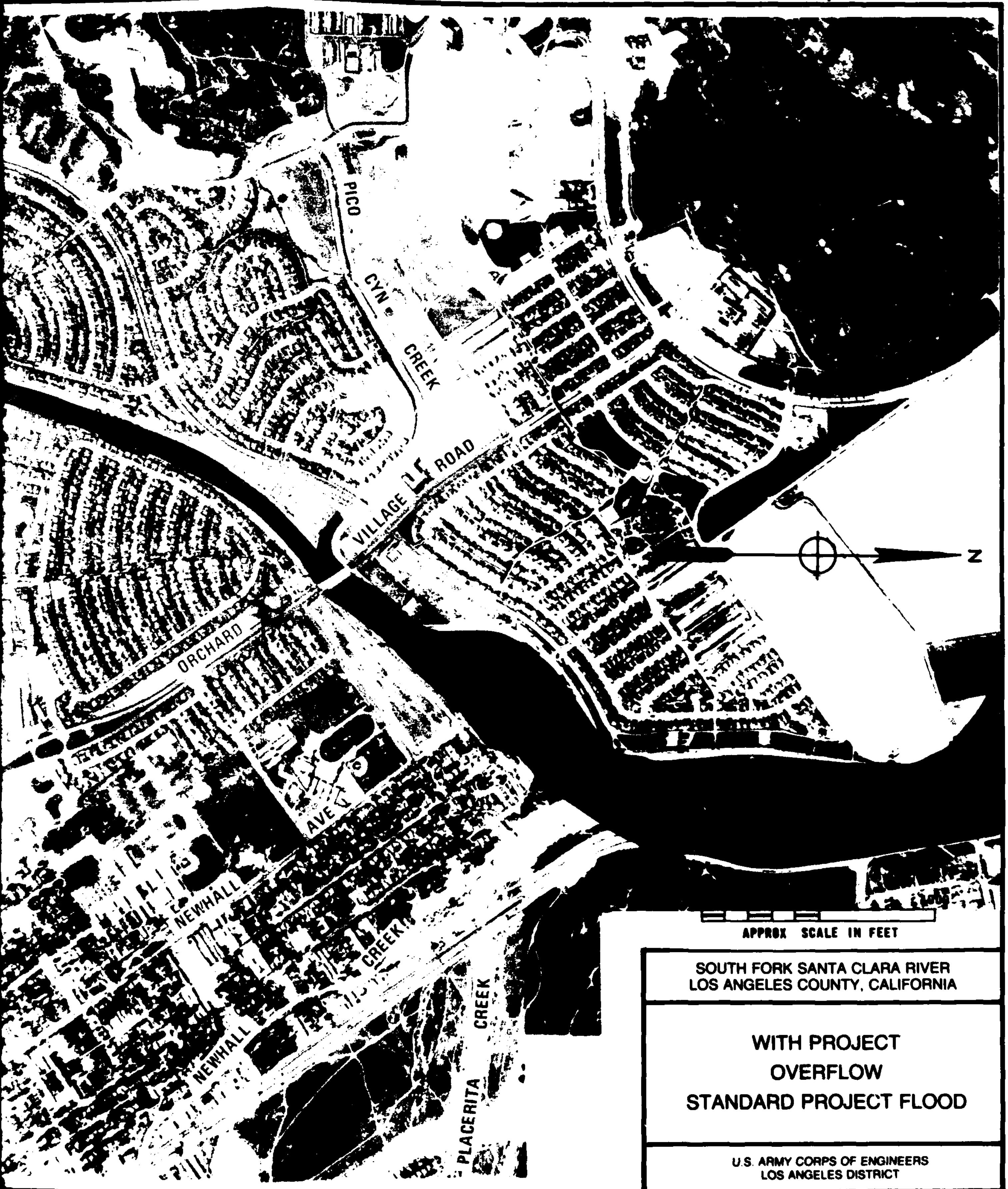
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

2



WILEY CYN
TOWSLEY CYN
LYON CYN
I-5
OAKRIDGE ESTATES


PICO
CYN
VILLAGE
ORCHARD
LYONS
AVE
AVE
NEWHALL
NEWHALL
RIDGE

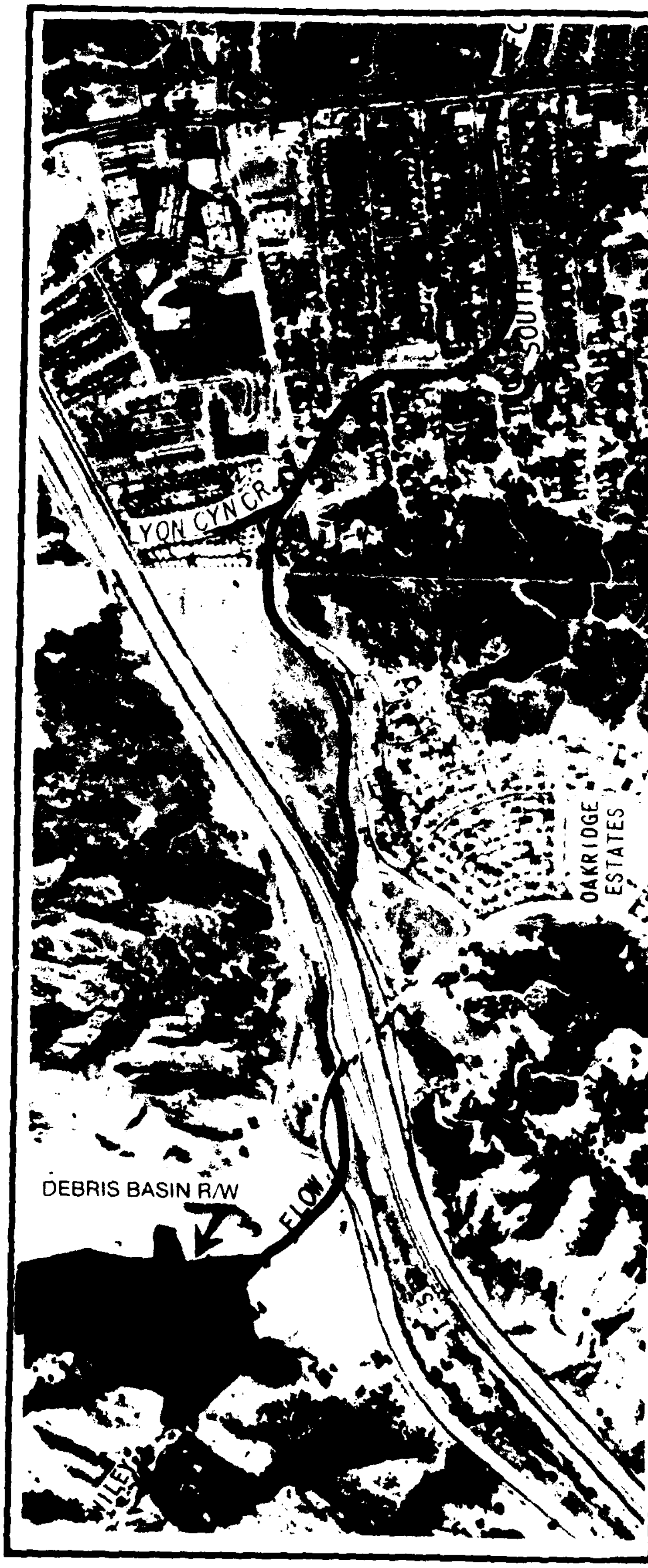


SOUTH FORK SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA

WITH PROJECT
OVERFLOW
STANDARD PROJECT FLOOD

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 5 3



SOUTH FORK SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA

DEBRIS BASIN AND CHANNEL R/W REQUIREMENTS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 6

SOUTH FORK SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA

DEBRIS BASIN
R/W REQUIREMENTS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 7

l

2

FINAL
ENVIRONMENTAL ASSESSMENT
SUPPLEMENTING
FINAL SUPPLEMENTAL ENVIRONMENTAL
IMPACT STATEMENT

Proposed flood control project for the
South Fork, Santa Clara River,
Los Angeles County, California

U.S. Army Engineer District
Los Angeles, California

January 1985

Finding of No Significant Impact

Proposed Flood Control Project for the South Fork,
Santa Clara River, Los Angeles County, California

I have reviewed the attached environmental assessment that has been prepared for the proposed Flood Control Project on the South Fork, Santa Clara River, Los Angeles County, California. The significant resources that could be affected by the action include ecological and cultural resources. The proposed action includes minor losses of riparian habitat, prime and unique farmland, grassland habitat, and walnut woodland and associated shrubland. These losses have been fully mitigated as described in the final environmental assessment, dated January 1985.

I have considered the available information in the environmental assessement and it is my determination that the impacts resulting from the proposed action will not have a significant effect on the environment or the quality of the human environment, and that an Environmental Impact Statement is not required.

29 JAN 85
Date

DENNIS F. BUTLER
COL, CE
Commanding

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SUMMARY

1.01 Various elements of this study are summarized below.

MAJOR CONCLUSIONS AND FINDINGS

1.02 This Final Environmental Assessment (FEA) supplements the January 1983 Final Supplemental Environmental Impact Statement (FSEIS) prepared for the South Fork flood control project. Wherever possible, it references the current Detailed Project Report (DPR) to avoid duplicating information. Six flood control alternatives were studied in detail for the DPR, and sections "Alternatives Considered Further" and "Assessment and Evaluation of Detailed Plans" of the DPR provide details on the alternatives and on the rationale for their selection. Chapters 4 and 5 of this FEA describe the significant environmental resources in the project area and the impacts of each project alternative on those resources.

1.03 In 1976, plan A was the tentatively selected plan, and it was endorsed by the area residents and the local sponsoring agency (The Los Angeles County Flood Control District). The Los Angeles County Flood Control District withdrew its support for the selected Plan in 1977, raising questions on the viability of the proposed debris basin at the junction of Wiley and Towsley Canyons. Local developers planned to develop low-density housing within the proposed debris basin area. This would raise the area's real estate value, making the right-of-way acquisition for the debris basin uneconomical.

1.04 Plan E-3 was then developed and tentatively selected as the recommended plan in the 1983 FSEIS. It involved the purchase of a mule ranch near the proposed inlet structure, levee, and deposition area. Many area residents preferred Plan A because they did not want to disturb the operation of the mule ranch. The ranch was built in an open field area that previously had been used for dumping and was an eyesore as well as a hazardous play area for children. Residents were concerned that the area might become an eyesore again if this land was purchased for flood control purposes; however, it was anticipated that this constraint would be overcome by leasing the land back to the owner so that he could continue operating the ranch.

1.05 In 1983, the local sponsor requested that Plan A be re-studied due to a lack of local support for Plan E-3. Plans for developing the upstream area for housing have been abandoned, thereby allowing the acquisition of rights-of-way to be more economically feasible. In addition, acquisition of rights-of-way for the 25-acre parcel that was recommended for a debris deposition area downstream of I-5 became too cost prohibitive for the County to continue supporting Plan E-3. Plan A is currently the recommended plan and has been modified slightly from the Plan A that was presented in the January 1983 FSEIS. The low-flow diversion channel that was included as mitigation in the previously described Plan A (1983 FSEIS) has now been deleted from the current plan and a new mitigation plan has been developed to compensate for the loss of wildlife habitat that would result from the implementation of Plan A. The new mitigation plan has been fully coordinated with concerned agencies. The low-flow diversion channel was deleted from the project description because

plans by the County of Los Angeles to realine Wiley Canyon Road were in conflict with the diversion channel plans. In addition, the construction of a 600-foot-long rectangular concrete channel extending from the downstream end of the debris basin spillway to The Old Road crossing, and seven bridges are included in the newly proposed Plan A.

1.06 Plan A provides an acceptable balance between the need to enhance and preserve the environment and the need to protect the residents of the area from flood hazards.

1.07 Positive environmental aspects of the plan include the following:

1. The preservation of 14.5 acres of land within the project right-of-way adjacent to and upstream of the proposed debris basin. Approximately 6.1 acres of riparian, 2.4 acres of walnut-oak woodland and .5 acres of coastal sage scrub of the 14.5 acres will be enhanced, resulting in the preservation of 8.3 acres of riparian, 3.5 acres of coastal sage, and 2.7 acres of walnut-oak woodland habitat.

2. The installation of 20 bird nest boxes in trees within the project area or immediate vicinity.

3. A two-year monitoring program in which planted areas within the 14.5 acres discussed in number 1 above are monitored with respect to wildlife usage and success of planting procedures.

1.08 The following adverse environmental effects will result from the recommended plan:

1. The loss of about 2 acres of riparian habitat, 2 acres of prime and unique farmland, 1.8 acres of grassland habitat, and about 4.5 acres of walnut woodland and associated shrubland (approximately 15 mature walnut trees and 1 mature oak within the 4.5 acres would be removed).

2. The elimination of about 7,000 feet of streambed recharge.

AREAS OF CONTROVERSY

1.09 The concerned public agencies and local interests agree on the need for flood protection for residents and merchants along the South Fork between Interstate 5 and Lyons Avenue. Certain aspects of the flood control plans have been controversial and are noted below.

1.10 Residents of the channel area have expressed concern regarding the recreational aspects of the proposed flood control project. They were concerned about the possible invasion of privacy by equestrians and bicyclists using the trails and the health and sanitation problems associated with having horse trails so near their homes. The recreation element has been deleted from the project, but the project, as designed, would accommodate recreation trails if the community wants them at a later date.

UNRESOLVED ISSUES

1.11 The only issue that remained unresolved in the 1983 FSEIS was resolved during the preparation of this report. Because the Los Angeles District felt that the previously proposed plan (Plan E-3) would not affect the potential habitat area for the slender-horned spineflower (Centrostegia leptoceras), a category 1 Federal candidate species, the District maintained that the botanical survey for this species that was recommended by the USFWS in their Final Coordination Act Report (July 1981) was not necessary. Upon the re-study of Plan A, the project area was surveyed for the presence of the spineflower in May 1984 by a Corps botanist and biologist. No suitable habitat and/or specimens of Centrostegia leptoceras were found within the project area.

RELATIONSHIP TO ENVIRONMENTAL REQUIREMENTS

1.12 Consideration of environmental laws, executive orders, and other policies in the planning process is noted as follows:

Federal

1.13 National Environmental Policy Act of 1969 (Public Law 91-190) as amended. All alternatives have been developed in accordance with the goals specified in Section 101 of the Act. This draft EA supplement to the 1983 FSEIS has been prepared in accordance with Section 102 of the Act.

1.14 The Clean Water Act of 1977 (Public Law 95-217). The District has prepared a 404(b)(1) water quality evaluation for Plan A that is included as Attachment A to this report.

1.15 The Clean Air Act, as amended. A copy of this draft EA supplement to the 1983 FSEIS will be forwarded to the Regional Administrator of the Environmental Protection Agency, Region IX, to request agency comments under Sections 176(c) and 309 of the Clean Air Act.

1.16 Endangered Species Act of 1973, as amended. As required by Section 7 of the Act, the Los Angeles District requested a list of threatened and endangered species in the project area by a letter to the USFWS dated 3 July 1980 during the preparation of the DSEIS, at which time Plan E-3 was the recommended plan. FWS responded by letters of 17 July 1980 and 30 July 1980, advising the District of listed, proposed, and candidate species in the project area. An updated list of threatened and endangered species that may occur within the project area was requested by letter of 23 January 1984 at which time Plan A was being re-studied. FWS responded by letter dated 17 February 1984 with an updated list of listed, proposed, and candidate species in the project area.

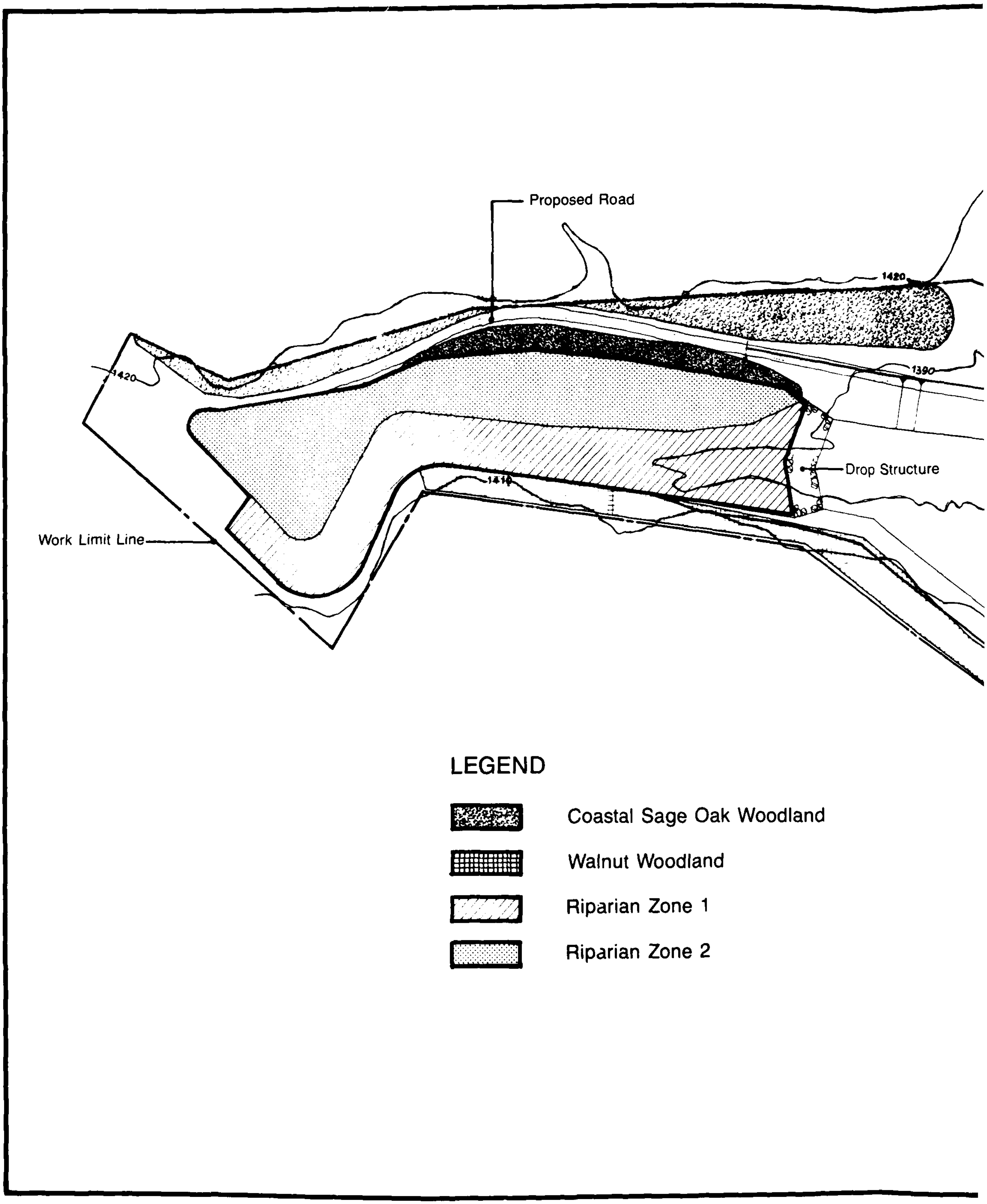
The Los Angeles District has initiated coordination during meetings with the USFWS and has determined that the proposed plan (Plan A) would have no significant impact on any proposed or listed endangered species, and is therefore in compliance with this Act.

1.17 Fish and Wildlife Coordination Act, as amended. In response to the requirements of this act, the District has conducted ongoing coordination efforts with the USFWS during the initial and current stages of planning. The USFWS submitted a Final Fish and Wildlife Coordination Act Report for the South Fork of the Santa Clara River on July 1981. This July 1981 report updated earlier coordination act reports (reference FSEIS, 1981). In the 1981 Final Fish and Wildlife Coordination Act Report the USFWS recommended that surveys be conducted for rare, threatened, or endangered species within the project area should either Plan A or B be selected. Surveys were conducted in May 1984 in response to this recommendation (see above discussion under Endangered Species Act). A draft and final supplemental Fish and Wildlife Coordination Act Report were submitted on 22 June 1984 and 10 October 1984, respectively, updating and reanalyzing the earlier report. The draft and final supplemental Fish and Wildlife Coordination Act Reports are included in Appendix G.

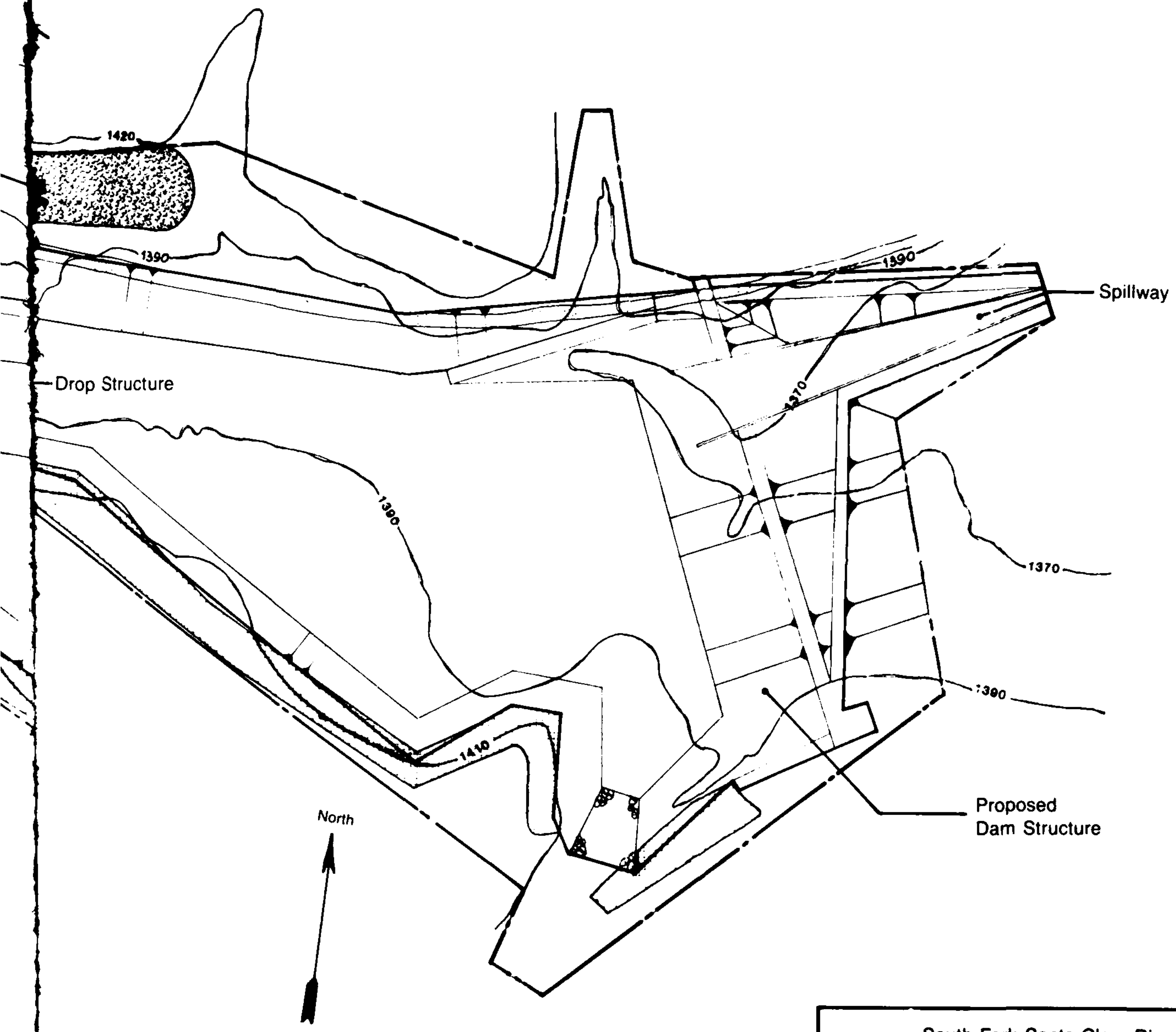
1.18 National Historic Preservation Act of 1966, as amended. An archeological survey of the project area was completed by the UCLA Archeological Survey under contract to the District in December, 1975. No cultural resources were encountered and additional studies were not recommended. The Office of Historic Preservation has stated in a letter dated 1 April 1976 that the project will not affect any properties included on or eligible for inclusion on the National Register of Historic Places. On September 17, 1984, a field reconnaissance was made of the area included in Plan A in order to update the survey conducted in 1975. This reconnaissance confirmed the 1975 findings. The Office of Historic Preservation has been notified of the results of the 1984 reconnaissance by letter dated October 4, 1984 and a concurrence with these findings has been requested.

1.19 Executive Order 11988, Flood Plain Management, 24 May 1977. Under this order, the Corps of Engineers must take action to avoid development in the base (100-year) flood plain unless it is the only practicable alternative; to reduce hazard and risk associated with floods; to minimize the impact of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial value of the base flood plain. A determination has been made that no practicable alternative exists to locating the project in the flood plain of the South Fork of the Santa Clara River. Approximately 8.3 acres of riparian habitat, 2.7 acres of walnut-woodland, and 3.5 acres of coastal-sage habitat would be preserved as open space under Plan A (fig. 1). The flood control alternatives considered in detail were similarly examined as noted in the GDM with regards to the objectives of Executive Order 11988, but construction of the proposed debris basin and flood control channel was determined to be the most practicable alternative.

1.20 Executive Order 11990, Protection of Wetlands. In developing the flood control alternatives, the Corps considered the project's effect on the survival and quality of wetlands. Implementation of Plan A would involve the destruction of about 2 acres of riparian habitat. Mitigation plans include the preservation from future development of approximately 14.5 acres of land within the project right-of-way adjacent to and upstream of the proposed debris basin. Approximately 6.1 acres of riparian habitat, 2.4 acres of walnut-oak woodland and .5 acres of coastal sage scrub of the 14.5 acres will


Proposed Road
1420
1420
1390
1410
Drop Structure
Work Limit Line
LEGEND
Coastal Sage Oak Woodland
Walnut Woodland
Riparian Zone 1
Riparian Zone 2

1



Scale: 1" = 100'

South Fork Santa Clara River
Los Angeles County, California

PROPOSED MITIGATION PLAN

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

EA-FIGURE 1

be enhanced to increase its wildlife value, resulting in the preservation of 8.3 acres of riparian habitat, 3.5 acres of coastal sage scrub, and 2.7 acres of walnut-oak woodland habitat as part of Plan A. By acquiring these areas, the Corps is in compliance with the goals of this Executive Order. All alternatives were considered with the goals and objectives of Executive Order 11990 in mind. The Corps has prepared a 404(b)(1) water quality evaluation (Attachment A) which discusses impacts of the proposed project on wetlands within the project area.

1.21 Analysis of Impacts on Prime and Unique Farmlands in EIS, CEQ Memorandum, 11 August 1980. By letter of 22 April 1981, the Soil Conservation Service (SCS), Escondido, has identified 22 acres in the project area as prime farmland. The information provided by the SCS is sufficient for all alternatives considered in detail, and the SCS letter is included in appendix G. The information provided in the SCS 1981 letter is still accurate and applicable to the proposed project (personal communication, SCS, 6 September 1984). The recommended plan (Plan A), would impact about 2 acres of prime and unique farmland. Paragraphs 3.18 and 4.16-4.18 discuss project effects on prime and unique farmland.

1.22 The following environmental statutes were determined to be not applicable to the South Fork of the Santa Clara River: Coastal Zone Management Act, as amended; Estuary Protection Act; Federal Water Project Recreation Act, as amended; Land and Water Fund Conservation Act of 1965, as amended; Marine Protection, Research and Sanctuaries Act of 1972, as amended; Wild and Scenic Rivers Act, as amended.

State

1.23 California Environmental Quality Act (CEQA). The proposed alternatives are in compliance with the goals of CEQA.

Local

1.24 Local Ordinances and Policies. The proposed alternatives are not in conflict with local ordinances.

PREVIOUSLY PREPARED ENVIRONMENTAL STATEMENTS

1.25 The Corps of Engineers prepared a draft environmental statement (DES) for Newhall, Saugus, and Vicinity, Los Angeles County, Santa Clara River and Tributaries, California, in April 1972. It was filed with the Council on Environmental Quality (CEQ) on May 3, 1972 and finalized in September 1972. A draft Supplemental Environmental Impact Statement (EIS) which recommended Plan E-3 was prepared in June 1981, and was finalized in January 1983. This final EA supplements the January 1983 Final Supplemental EIS and recommends Plan A. Copies of previously prepared environmental statements are on file at the Los Angeles District Office.

NEED FOR AND OBJECTIVES OF ACTION

2.01 The need for a flood control project and the project's objectives are discussed below.

STUDY AUTHORITY

2.02 The study to determine the need for flood protection was authorized by a resolution of the Committee on Public Works of the United States Senate, adopted June 18, 1963. The DPR provides detailed project authorization information under the heading "Authority."

PUBLIC CONCERNS

2.03 A Citizens Advisory Committee was formed in September 1975 to express local desires and assist in project formulation. The major public concern was development of a plan to control flooding on the South Fork of the Santa Clara River. The public initially preferred Plan A in 1976 when a plan for flood control for the South Fork was being recommended; however, the cost of acquiring the right-of-way for the debris basin upstream of I-5 was prohibitive and in 1983 Plan E-3 became the recommended plan. The change from Plan A to Plan E-3 caused some public controversy because plan E-3 involved buying a mule ranch at the proposed inlet structure and many citizens expressed concern that an open space area at the inlet would become an illegal dump site for trash and an eyesore. The 25-acre parcel of land that was recommended for a debris deposition area downstream of I-5 under Plan E-3 has now become less desirable for use as a flood control feature because right-of-way costs would be prohibitive because of the land's prime location and possible future uses.

PLANNING OBJECTIVES

2.04 The project planning objectives are enumerated as follows in the main report under the heading "Recommended Plan Modifications." They are:

a. Provide flood control to residents of the South Fork flood plain, from the junction of Wiley and Towsley Canyons to Lyons Avenue.

b. Maintain existing environmental conditions in the project area through mitigation measures.

ALTERNATIVES

3.01 The various flood control alternatives are discussed below.

PLANS ELIMINATED FROM FURTHER STUDY

3.02 A number of plans were considered during the preliminary planning process but were eliminated because of alternative benefit/cost ratio and local economic and social considerations. These alternatives are outlined briefly in the following subparagraphs.

Plan C

3.03 This plan would use a debris basin at the junction of Towsley and Wiley Canyons, and a 100-year earth-bottom trapezoidal channel between I-5 and Lyons Avenue to protect the area from floods. This alternative was rejected because of unfavorable economics and because it would involve the relocation of 25 homes and 2 businesses. The Oakridge Estates Homeowners Association was concerned that a trapezoidal channel, which would be about 100 feet wider than a comparable rectangular concrete channel, would be a conspicuous eyesore.

Plan D

3.04 This plan would use a debris basin like that of plan C, as well as a combination trapezoidal earth-bottom channel and rectangular concrete channel between I-5 and Lyons Avenue. These channels would protect the area from the 100-year flood. This plan was no longer considered because it would provide less net benefits than plan B with the same flood protection. In addition, the homeowners association was concerned that a trapezoidal earth-bottom concrete channel would be an eyesore.

Plan E-1

3.05 This plan would protect the area from the standard project flood through the following: construction of a debris basin at the junction of Towsley and Wiley Canyons; a floodwall parallel to Wiley Canyon Road; construction of a levee along the south side of a mobile home park to contain floodflows in the open-space floodway; construction of a low-flow earth channel from I-5 to a point about 800 feet upstream from Wiley Canyon Road; and construction of a rectangular concrete channel from the downstream end of the open-space floodway to Lyons Avenue. This alternative was rejected because of marginal economic justification and community opposition. Residents say that the open space would be an eyesore and a hazardous play area for children.

Plan E-2

3.06 This plan would protect the area through construction of similar elements to those in plan E-1, except that it would be scaled down to accommodate a 100-year discharge. No modifications would be necessary on the existing flood control channel downstream from Lyons Avenue. The plan was rejected for the same reasons as for plan E-1.

Plan F

3.07 This plan would protect the area from the standard project flood through construction of a retention dam at the junction of Towsley and Wiley Canyons, and a smaller rectangular concrete channel between I-5 and Lyons Avenue. This plan was rejected because of high cost and lack of economic justification.

WITHOUT CONDITIONS (NO ACTION)

3.08 Without any Federal project, the flood plain of the South Fork will continue to be subject to flooding. The Los Angeles County Flood Control District, because it has limited funds for channel improvement, would probably implement flood plain management in the project area under the direction of the Federal Flood Insurance Administration. The subdivision that was tentatively planned in the vicinity of Towsley and Wiley Canyons which consisted of a residential tract of 48 dwelling units on 241.58 acres of land is no longer planned (personal communication, Los Angeles County Regional Planning, Subdivision Section, 13 September 1984). No changes are expected to occur downstream along the mule ranch or in the residential area upstream from Lyons Avenue, although the area between I-5 and the Wiley Canyon Road crossing is zoned medium-density residential (3.4 to 6.6 dwelling units per acre) (Santa Clarita Valley Areawide General Plan, Adopted February 16, 1984, Los Angeles County Department of Regional Planning).

PLANS CONSIDERED IN DETAIL

3.09 Four structural plans passed the preliminary screening and were carried forward into plan-formulation studies. Each includes an esthetic treatment plan consisting of about 2.5 acres of hydroseeding of native grasses and ground cover along the channel, and the planting of native shrubs and trees. A more detailed description of this program and a listing of the recommended plant species is presented in paragraphs 4.22-4.27 of this report and in Appendix G. Plan H, the "no action" plan and plan G, the flood plain management plan, were also studied in more detail. These plans are summarized in the following subparagraphs (the main report discusses details of implementation responsibilities for each plan under the heading, "Project Alternatives."

Plan A

3.10 Plan A is the recommended plan and would provide standard project flood protection. Plan A consists of the following features (see pl. D-1 in DPR):

a. A debris basin at the junction of Towsley and Wiley Canyons;

b. A rectangular concrete channel approximately 600 feet long, 25 feet wide, and 9 to 12 feet deep extending from the downstream end of the debris basin spillway to The Old Road crossing;

c. A rectangular concrete channel approximately 1.2 miles long, 28-38 feet wide and 11.0 to 15.5 feet deep extending from Calgrove downstream to Lyons Avenue;

d. Addition of two feet of freeboard to the existing flood control channel downstream of Lyons Avenue for a distance of 3050 feet;

e. Replacement of dip crossings at Atwood Boulevard, DeWolfe Road and at Lyon channel 400 feet upstream from its confluence with the South Fork channel. Construction of three new bridges, one at the end of the

debris basin spillway and the other two where the future route of Wiley Canyon Road crosses Lyon channel and the South Fork channel. Also included is the reconstruction of the existing bridge at Calgrove Boulevard.

3.11 The County of Los Angeles is currently planning to straighten Wiley Canyon Road, and any impacts resulting from this project would be addressed in an environmental report prepared by the County.

3.12 Environmental measures for Plan A include the preservation from future development of approximately 14.5 acres of land within the project right-of-way adjacent to and upstream of the proposed debris basin. Approximately 6.1 acres of riparian habitat, 2.4 acres of walnut-oak woodland and .5 acres of coastal sage scrub of the 14.5 acres will be enhanced to increase its wildlife valve, resulting in the preservation of 8.3 acres of riparian habitat. 3.5 acres of coastal sage scrub, and 2.7 acres of walnut-oak woodland habitat. Also part of the environmental measures for Plan A would include the installation of nest boxes, and a two-year monitoring program. Refer to section 5.05 of this report for a more detailed description of the proposed environmental measures.

Plan B

3.13 This plan is essentially the same as plan A except that it has been scaled down to accommodate the 100-year flood. The mitigation measures are also the same as for plan A. Plan B has the highest benefit/cost ratio and it is the National Economic Development (NED) plan.

Plan E-3

3.14 The environmental quality (EQ) plan is that plan that will address the problem of reducing flood damages while maximizing contributions to esthetic, ecological, and cultural values. Plan E-3 is designated the environmental quality plan. Of the plans considered, this plan provides the greatest opportunity for maintaining streambed habitats, and still meets the basic objectives of providing of a high degree of flood protection. E-3 is designed to contain flows from the standard project flood. It would provide for a debris deposition area between I-5 and the channel inlet structure, construction of an inlet structure 600 feet upstream from the Wiley Canyon Road bridge, and construction of a 4200-foot-long rectangular concrete channel from the inlet to Lyons Avenue. A 600-foot-long levee would be built from the inlet structure to I-5 and new bridges would be built to replace dip crossings at Atwood Boulevard and DeWolfe Road. An additional flood control feature is a low-flow channel which would serve to support the existing riparian growth between I-5 and the inlet structure. Esthetic treatment for this plan includes planting a greenbelt of native drought-tolerant plant species along the proposed channel right-of-way from the inlet structure to Lyons Avenue.

Plan E-4

3.15 This plan is essentially the same as plan E-3 except that it has been scaled down to accommodate the 100-year flood.

Plan G

3.16 This flood plain management plan was carried forward as a nonstructural solution. Floodwalls would be built around existing structures to prevent damages from the 100-year flood. This plan would also involve flood insurance and restrictions on future development in the 100-year flood plain. A flood warning system would be installed in the upper watershed to give advance warning of flood. No mitigation requirements are anticipated with this alternative.

Plan H

3.17 Plan H is the "no action" plan. Flood insurance would be considered as compensation for flood damage suffered by property owners. The Flood Insurance Program would require that new development be elevated or otherwise protected from a 100-year flood. Existing development would undergo no structural protective measures and would remain subject to flood damage. No mitigation requirements are anticipated with the "no action" alternative.

COMPARATIVE IMPACTS OF ALTERNATIVES

3.18 The impacts of the detailed plans on significant resources in the project area (as defined by the "Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act", 40 CFR Parts 1500-1508, November 19, 1978) and the plan economics are summarized in table EA-1. The significant resources shown in the table are described in section 4, "Affected Environment," and the effects of each alternative on those resources are discussed in section 5, "Environmental Effects."

AFFECTED ENVIRONMENT

ENVIRONMENTAL CONDITIONS

4.01 The South Fork of the Santa Clara River is an intermittently flowing stream that originates in the San Gabriel and Santa Susana Mountains. It passes through unincorporated land in the Santa Clarita Valley. The project area lies at the east edge of the Ventura Basin, with most of the drainage area of the South Fork consisting of steep barren mountains. Overlapping the older sediments on the northern flank of the Santa Susana Mountains are older Pleistocene sediments composed of sandstones and conglomerates. Blanketing the South Fork area are alluvium--consisting of poorly bedded, unconsolidated gravel, sand, and silt--and Pleistocene terrace deposits--consisting of crudely stratified gravel, sand, and silt. The project area is within 20 miles of two active faults, the San Andreas and the San Fernando-Sierra Madre. These faults can produce a maximum credible event of a Richter magnitude between 7.3 and 8.5.

Plan	Biological Resources	Endangered Species	C Paleont
Base condition	Grassland, coastal sage scrub, and riparian habitats dominant the upstream reach, above I-5. Between I-5 and Wiley Canyon Road, there is a thick growth of riparian habitat with an old field east of the stream. Below Wiley Canyon Road, the biological community has been modified by flood control improvements.	No threatened or endangered species were observed in the project area, but the potential exists for Centrostegia leptoceras and/or Vireo bellii pusillus (California least Bell's Vireo).	Fossil around
"No Action," plan H	No impact	No impact on any threatened or endangered species.	No impa
Floodproofing, plan G	Would not destroy existing riparian habitat and ruderal vegetation in and along stream channel, and would not displace wildlife.	No impact on any threatened or endangered species.	No impa
Plan E-3	5 Acres of sparsley vegetated earthen channel will be converted to a rectangular concrete channel, and approximately 1 acre of riparian habitat and 3 acres of pastureland will be destroyed by construction of the inlet structure and levee. Very little wildlife would be displaced by the channel, and planting native species along the channel would minimize any impacts.	No impact on any threatened or endangered species.	No impa
Plan E-4	Same as E-3	Same as E-3	Same a

TABLE I

...ed Species	Cultural and Paleontological resources	Ground water resources	Developable lands	Esthe...
...ned or endan- ...ies were ...n the project ...the potential ...Centrostegia and/or Vireo ...illus (Cali- ...st Bell's	Fossil sites in and around Towsley Canyon.	1.3 miles of earth-bottom channel with average annual ground water recharge from streambed infiltration of 2200 acre-feet. There are 2 operating wells within 2 miles of the proposed project.	40 acres of open space between I-5 and Wiley Canyon Road available for medium density residential development. Area at junction of Towsley and Wiley Canyons is zoned for flood control.	The l... downs... Canyo... devel... ident... atmos... a mul... eques... upstr...
...on any ...or endangered	No impact	Would not eliminate or reduce existing recharge capability of streambed.	Construction would be regulated in the 100-year flood plain.	No im...
...on any ...or endangered	No impact	Would not eliminate or reduce existing recharge capability of streambed.	Would restrict construction in the 100-year flood plain.	Flood struc... esthe... unapp...
...on any ...or endangered	No impact	Would eliminate 4200 feet of existing recharge capability of stream. This would cause a loss of about 28 acre feet ground water recharge per year.	Would preclude development of 40 acres between I-5 and Wiley Canyon Road. This area would be maintained as an open-space floodway.	4200 ...gular will esthe... speci... chann... this...
...3	Same as E-3	Same as E-3	Same as E-3	Same...

TABLE EA-1. Comparative Impacts of Alternatives. (South Fork, Santa Clara River, California)

ources	Developable lands	Esthetics	Plan economics
th- ith round rom ation . ating iles of ject.	40 acres of open space between I-5 and Wiley Canyon Road available for medium density residential development. Area at junction of Towsley and Wiley Canyons is zoned for flood control.	The lower reach downstream of Wiley Canyon Road mostly developed with residential structures, atmosphere. There is a mule ranch and an equestrian center upstream.	Not applicable.
ate or recharge reambed.	Construction would be regulated in the 100-year flood plain.	No impact.	Costs = $0. B/C ratio = none. Net benefits = $0.
ate or recharge reambed.	Would restrict construction in the 100-year flood plain.	Flood walls around structures would be esthetically unappealing.	Cost = $8,280,000 B/C ratio = 0.7 Net benefits = -$227,000
4200 feet arge ream. a loss feet harge	Would preclude development of 40 acres between I-5 and Wiley Canyon Road. This area would be maintained as an open-space floodway.	4200 feet of rectangular concrete channel will alter the esthetics but planting species along the channel will minimize this impact.	Costs = $7,850,000 B/C ratio = 1.01 Net benefits = +$10,000
	Same as E-3	Same as E-3	Costs = $ 6,750,000 B/C = 1.1 Net benefits = + $72,000

Plan	Biological Resources	Endangered Species	Cultural an Paleontological r
Plan A, plan B, debris basins*	Debris dam would destroy 1.8 acres of grassland, and about .5 acres of riparian habitat and disturb about 4.5 acres of oak-walnut woodland reducing the wildlife carrying capacity by 5 percent. 1.5 acres of riparian habitat and 2 acres of old-field habitat would be destroyed during construction of the channel. Mitigation measures such as revegetating with native riparian species adjacent to the debris basin, bird nesting boxes, and planting native species along the channel would minimize these impacts.	Surveys were conducted for Centrostegia leptoceras, Hemizonia minthornii, vireo bellii pusillus, Polioptila melanura and gasterosteus aculeatus williamsoni in May 1984. No rare, threatened or endangered species were observed in the project area.	Closest known sit a hillside north Towsley Canyon. proposed debris d approximately 100 south of this sit impact.

* The impacts of Plans A and B are essentially the same.

	Cultural and Paleontological resources	Ground water resources	Developable lands	Esthetics
ed for as, s, nd s 984. or re ect	Closest known site is on a hillside north of Towsley Canyon. The proposed debris dam is approximately 1000 feet south of this site. No impact.	Would eliminate 1.3 miles of existing recharge capability, which would result in an average annual loss of about 37 ac-ft recharge.	Would preclude any development upstream of the proposed debris basin. Would permit development of area downstream of proposed debris basin within South Fork watershed.	The debris basin 1.3 miles of rec concrete channel alter the esthet from a modified environment to a then dam and con channel. Planti native species c dam face and alc channel will mir this impact.

2

Table EA-1. Continued

rces	Developable lands	Esthetics	Plan economics
3 miles ge would ge ut 37	Would preclude any development upstream of the proposed debris basin. Would permit development of area downstream of proposed debris basin within South Fork watershed.	The debris basin and 1.3 miles of rectangular concrete channel will alter the esthetics from a modified natural environment to an earthen dam and concrete channel. Planting native species on the dam face and along the channel will minimize this impact.	Plan A Costs = $10,931,000 B/C ratio = 1.1 Net benefits = +$64,000 Plan B Costs + $9,995,000 B/C ratio = 1.1 Net benefits = + $115,000

4.02 The climate of the Santa Clara River basin is generally mild and has long, dry summers, and short, mild winters. Rain averages 12 to 18 inches a year and falls mostly in winter. The South Fork is in the South Coast Air Basin, a highly urbanized area, and some photochemical smog is present during most of the summer and fall. Most of the project area is within 4000 feet of the Golden State Freeway (I-5), a major north-south route, and the upper reaches are within the 60-decible Noise Impact Management Areas (Santa Clarita Valley, Areawide General Plan, February 16, 1984). The sediments immediately underlying the South Fork are Recent and Pleistocene alluvial sands and gravels containing important aquifers at various depths.

4.03 The upper reach of the study area, at the junction of Wiley and Towsley Canyons, is still mostly undeveloped. Limited riparian habitat occurs along the creekbeds, with grassland covering the flat open areas. Coastal sage scrub and oak woodlands cover the hillsides with mixed conifer stands at higher elevations. There is a dense band of riparian habitat along the creek between I-5 and the Wiley Canyon Road crossing, and there is an open field between commercial and residential areas. The downstream reach of the river, between Wiley Canyon Road and Lyons Avenue, flows through a residential area in an earth-bottom channel. The biological community in this reach has been modified by flood control improvements built by the Los Angeles County Flood Control District, and most of the vegetation is composed of weedy annual species.

4.04 The lower reach, downstream from Wiley Canyon Road, is largely developed with residential and commercial structures, while the upstream reaches are still rural. The mule ranch is north of I-5, just south of the Wiley Canyon Road Bridge, and an equestrian center is at the junction of Wiley and Towsley Canyons.

SIGNIFICANT RESOURCES

4.05 Resources within the project area that are considered to be significant are discussed in detail in the following paragraphs.

Biological Resources

4.06 The study area along the South Fork has been divided into three reaches to facilitate discussion of the biological communities. Reach 1 extends from about 2300 feet upstream of the proposed debris basin to the Golden State Freeway (I-5); reach 2 extends from I-5 downstream to a point approximately 600 feet upstream from the Wiley Canyon Road crossing and reach 3 extends from a point approximately 600 feet upstream from the Wiley Canyon Road crossing downstream to Lyons Avenue. Reach 1 has been modified from the 1983 FSEIS to include the right-of-way area upstream of the proposed debris basin. See figure 2 for a map of the biological reaches. Indicator species are listed for each community; a more complete list and field notes are found in Appendix G.

4.07 REACH 1. This reach is approximately 4700 feet from the upstream end of the right-of-way area downstream to I-5. A privately owned ranch and equestrian center is located in this area. Oak-walnut woodland communities

occupy the low, north-facing slopes, while there is coastal sage scrub habitat on the south-facing slopes and on higher slopes. Grassland habitat occupies the flatter portions of the canyons and limited riparian habitat exists in and along creeks in the canyons.

4.08 The oak-walnut woodland community forms a transition from coastal sage scrub that grows on the higher and drier slopes and riparian communities below. Juglans californica (California walnut) and Quercus agrifolia (coast live oak) are common associated species. There are local patches of coastal sage scrub species such as Salvia leucophylla (purple sage), Rosa californica (California wild rose), and Artemisia californica (California sagebrush) in the oak woodland. Herb cover is typically heavy throughout the woodland, indicating that good soil moisture is available. The more arid slopes are dominated by a coastal sage scrub community. Representatives observed in this community include Salvia mellifera (black sage), Artemisia californica (California sagebrush), Eriogonum fasciculatum (California buckwheat), and Eriodictyon crassifolium (Yerba Santa). Open grassy areas at the junction of the two canyons and downstream to I-5 are covered by exotic weedy species. Eremocarpus setigerus (turkey mullein) indicates the area has been overgrazed; Erodium spp. (folaree), Malva parviflora (cheeseweed), and Brassica spp. (mustard) are all common in this area. There is a poorly developed riparian community along the creeks in the canyons. The most widespread and characteristic riparian species is Baccharis glutinosa (mulefat). Scattered sycamore, elderberry, and coast live oak trees grow along the channel, and the banks are typically lined with remnants of the coastal sage scrub community.

4.09 Basin habitat supports mammals (such as mule deer, coyote, Audubon cottontail, and California ground squirrel), and birds (such as scrub jay, California quail, American Kestrel, red-tailed hawk, mourning dove, and brown towhee). Aquatic habitats along the creeks appear to be very poorly developed, however, some amphibians and reptiles live in and along the channel.

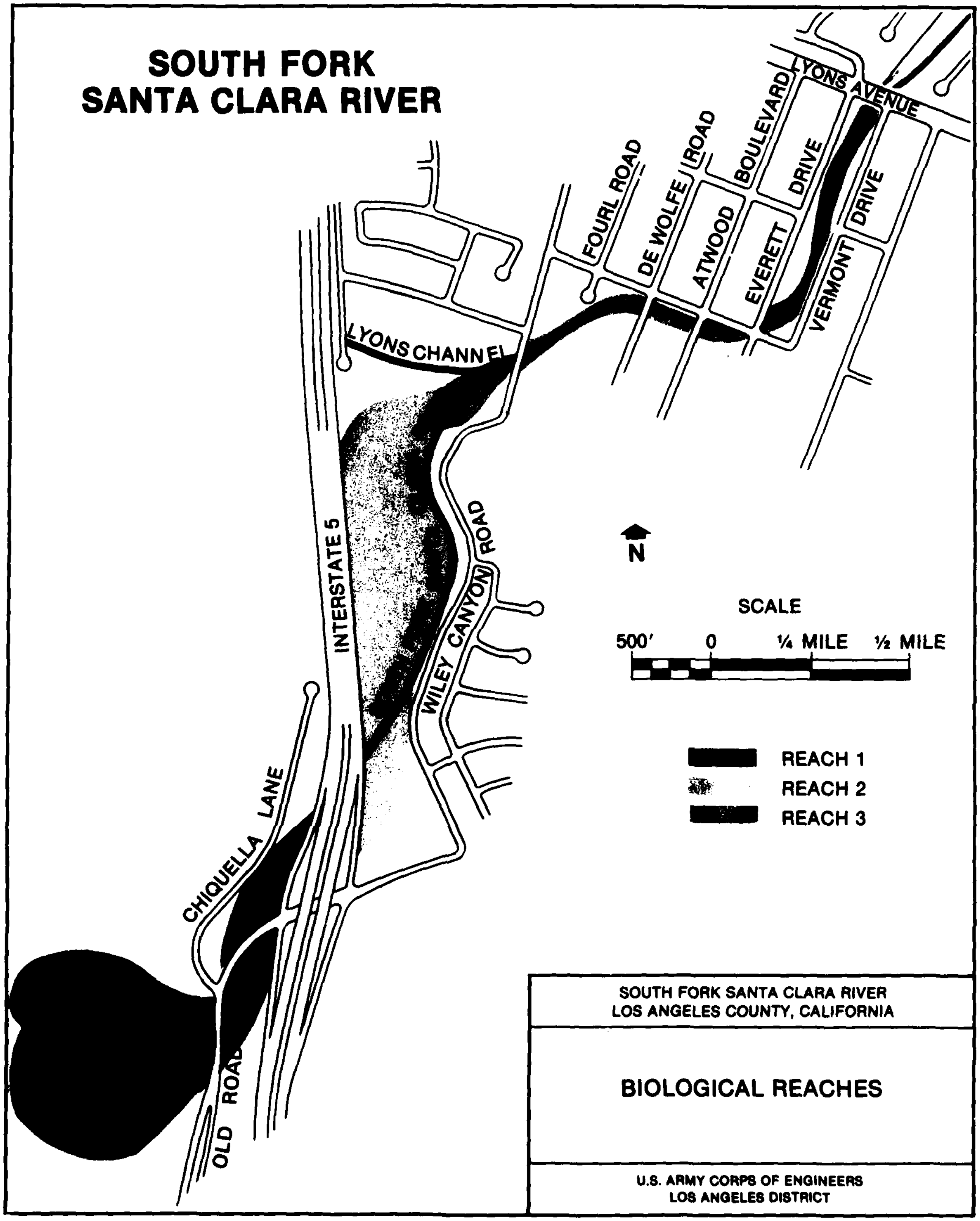
4.10 REACH 2. A riparian community dominates this reach (approximately 2050 feet), which is bounded by I-5 on the west and Wiley Canyon Road on the east. Along the stream on the southernmost portion of this reach is a band of dense riparian habitat, approximately 2000 feet long, and the growth is very thick, uniform in height, and relatively immature. Diversity of vegetation in this reach is high, and includes cottonwoods, willows, sycamore, mulefat, elderberry, cattail, and giant reed. There is a sandy wash area between the riparian habitat and I-5 and there is a disturbed upland habitat between the stream and Wiley Canyon Road. Some species observed in this area were chamise, Russian thistle, telegraph weed, white sage mustard, and coyote brush. Vegetation south of Lyon Canyon Creek consists of grassy fields (22.8 acre mule ranch) used mainly for grazing. The riparian community is scarcer and more disturbed at the northern end of Reach 2.

4.11 The riparian community provides good habitat for cottontail, California quail, mourning dove, ground squirrels, raptors, and a variety of passerine birds. Several species of reptiles and amphibians also were observed in and near the stream channel. Pacific tree frog, western toad, and several skinks were seen in the area. Outside the riparian zone, the upland areas support an old field community of relatively low value to wildlife.

4.12 REACH 3. From a point approximately 600 feet upstream from the Wiley Canyon Road crossing downstream to Lyons Avenue (approximately 3950 feet), the stream flows through an earth-bottom pipe and wire-revetted flood control channel with residential development along both sides. The biological community along this reach has been modified by flood control improvements built in 1970 by the Los Angeles County Flood Control District. There are a few young cottonwood trees in and along the channel near Lyons Avenue, but the channel supports mainly weedy opportunistic species. English sparrow, house finch, and common crow were the only wildlife observed during field investigations for the project.

Threatened and Endangered Species

4.13 Pursuant to Section 7 of the Endangered Species Act of 1973, as amended, the Los Angeles District requested a list of threatened and endangered species in the project area by a letter to the USFWS (Sacramento Endangered Species office) dated 3 July 1980 during the preparation of the DSEIS, at which time Plan E-3 was the recommended plan. FWS responded by letters of 17 July 1980 and 30 July 1980 (Reference FEIS 1983, Appendix G), advising the District of listed, proposed, and candidate species in the project area. An updated list of threatened and endangered species that may occur within the projec area was requested by letter of 23 January 1984 at which time Plan A was being re-studied. FWS responded by letter dated 17 February 1984 (Appendix G) with an updated list of listed, proposed, and candidate species in the project area. The February 17, 1984 listing contained: Listed endangered species: unarmored threespine stickleback (Gasterosteus aculeatus williamsoni); and candidate category 1 species: slender-horned spineflower (Centrostegia leptoceras). The July 30, 1980 FWS Endangered Species list contained the California Condor (Gymnogyps californianus) an endangered species and the Least Bell's vireo (Vireo bellii pusillus) a candidate category 1 species plus the slender-horned spineflower also a candidate category 1 species. The difference in the two lists was brought to the attention of the FWS (Sacramento Endangered Species office). FWS responded (telephone conversation record Sept. 19, 1984) that the difference was due to reevaluation of the involved species by their endangered species specialist. FWS felt the distribution of the California condor and the least Bell's vireo would not occur within the project area. However, during informal discussions with FWS (Laguna Niguel) the COE agreed to survey for the February 17, 1984 mandated species plus the least Bell's vireo a species FWS (Laguna Niguel) felt might occur within reach 2 of the project area. In addition, the black-tailed gnatcatcher (Polioptila melanura) and Santa Susanna tarweed (Hemizonia minthornii were also surveyed for. The black-tailed gnatcatcher is a species FWS believes will soon be proposed for listing on the Federal Threatened and Endangered Species list. This species is currently on the Audubon blue list for species considered in jeopardy. The Santa Susana tarweed is currently on the State of California list as a rare species. The results of the Corps surveys are discussed below.


SOUTH FORK
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REACH 2
REACH 3
CHIQUELLA LANE
OLD ROAD
SOUTH FORK SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA
BIOLOGICAL REACHES
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

EA-FIGURE 2

a. Plants. A survey was conducted in May, 1984, (MFR; 19 June 84) for the slender-horned spineflower (Centrostegia leptoceras) and Santa Susana tarweed (Hemizonia minthornii). The survey detected no specimen of either species within the project area. The project area was also surveyed for any area of suitable habitat for either species. No area of suitable habitat was found to exist within the project area.

b. Birds. Least Bell's vireo (Vireo bellii pusillus) was surveyed for in October 1980 (MFR; 7 Oct. 80) and again in May 1984 (MFR; 19 June 84) along reach 2 of the project area. FWS (Laguna Niguel) suggested the riparian habitat within this reach might serve as the only marginal habitat within the project area for a few nesting pairs of least Bell's vireo. The surveys failed to detect the presence of the species within the project area. The riparian vegetation along reach 2 was also inspected for vireo nests or eggshells but the survey failed to establish the utilization of the project area by least Bell's vireo. The black-tailed gnatcatcher (Polioptila melanura) was determined not to be found within the project areas. A telephone conversation (6 June 84) with J. Atwood, UCLA Biologist and local expert on the black-tailed gnatcatcher stated there are no known sightings of the species in the Newhall, California area.

c. Fish. The unarmored threespine stickleback (Gasterosteus aculeatus williamsoni) does not occur within the project area. The South Fork of the Santa Clara River is an intermittent stream with surface flow occurring only sporadically during the winter and spring months. Consequently the project area affords no suitable habitat for this species and no fish of any kind have been observed in the project area during site visits.

Paleontological and Cultural Resources

4.14 There are many fossil sites in the study area. Numerous white fossil shells of clam, scallop, oyster, and turritellas, along with other debris, may be found cemented into the yellow sandstone conglomerate. Marine invertebrate fossils of the Tertiary age can be collected from certain outcrops of Eocene sandstone found in a small area in Elsmere Canyon, as well as from the Miocene Topanga sandstone and the Modelo shale found near the crest of the Santa Susana Mountains in Aliso and Rice Canyons. Fossil areas are in the upper Miocene Towsley sandstone and mudstone found in and around Towsley Canyon on the north drainage of the Santa Susana Mountains. The most abundant fossil areas are from exposures of the Pliocene Pico siltstone and sandstone found throughout most of the Ventura Basin. The upper Pliocene-lower Pleistocene sandstone and conglomerate yield occasional fossils from outcrops between Towsley Canyon and Newhall. An archeological survey of the project area was completed by the UCLA Archeological Survey under contract to the District in December 1975 and a field reconnaissance was conducted on 17 September 1984 to confirm the present validity of the 1975 report and verify that no significant historic structures exist in the project area. No cultural resources were encountered in the project area on either the survey or the reconnaissance; therefore, the project would have no impact on National Register eligible sites.

Water Quality

4.15 The South Fork of the Santa Clara River is an intermittent stream. When floodwaters occur, they are usually composed of various physical and organic elements which are indigenous to the drainage area. These elements are further described in paragraphs 3.01, and 3.07 to 3.12. It is not anticipated that floodwaters would carry contaminants since the drainage area is relatively free of pollutants. Please refer to Attachment A, Section 404(b)(1) Water Quality Evaluation.

Ground Water Resources

4.16 The sediments underlying the South Fork of the Santa Clara River contain important aquifers at various depths. The main source of ground water recharge is rainfall, and the average annual recharge from streambed infiltration of the South Fork of the Santa Clara River is estimated at about 2200 acre-feet. The depth to ground water in the study area varies with ground surface elevation and season. Hydrologic data from 1974 indicates that ground water levels measured at various wells in the study area are at their highest in the spring while at their lowest in the fall. Depth to the ground water table in the immediate project area downstream of the proposed debris basin was in the 60- to 100-foot range, even during periods of greatest recharge. Trench and test hole measurements of depth to ground water taken between April and July 1984 in the proposed debris basin area indicate that a perched water condition exists in that area. Depth to the ground water table in the proposed debris basin area was in the 8- to 20-foot range.

4.17 Three companies supply water to the residents of the Santa Clarita Valley: Newhall County Water District, Santa Clarita Water Company, and Valencia Water Company. Ground water is the major source of municipal water in the area; these companies are currently pumping a total of about 15,000 acre-feet of water from the general basin area annually (personal communication, Valencia and Santa Clarita Water Companies and Newhall County Water District, 14 September 1984). All three water companies plan to continue pumping approximately 5,000 acre-feet of ground water each per year in the near future; however, a significant increase in residents may result in an increase of current ground water pumping rates. The ground water table in the general basin area is generally considered to be stable at the present time. A decrease in agriculture in the area has permitted replenishment of ground water supplies.

Prime and Unique Farmland

4.18 Approximately 22.3 acres in the project area are currently undeveloped and have been identified as Prime and Unique farmland by the Soil Conservation Service (SCS) (ref. letter dated 22 April 1981 and personal communication, SCS, 6 September 1984). A mule farm occupies 16.8 of the 22.3 acres adjacent to the proposed flood control channel and inlet of Lyon Canyon Creek, and there is a horse ranch on about 2 acres upstream from I-5 on the site of the proposed debris dam. The remaining 3.5-acre area, between I-5 and the mule farm, is currently vacant.

Developable Land

4.19 Land-use trends in the Santa Clarita Valley, north Los Angeles County, are discussed in detail in Appendix E, "Economics."

ENVIRONMENTAL EFFECTS

5.01 The environmental effects the detailed project alternatives would have on the significant resources in the area are discussed below.

BIOLOGICAL RESOURCES

5.02 One nonstructural, four structural, and the "no action" alternatives have been identified for flood control along the South Fork. The impacts of the various alternatives on biological resources are outlined in the following paragraphs.

5.03 The impacts of plans A and B on the biological resources in the project area are essentially the same. Each involves construction of a debris basin and concrete channel downstream to Lyons Avenue. Construction of a debris basin would eliminate 1.8 acres of grassland habitat and about .5 acres of riparian habitat, and disturb about 4.5 acres of oak-walnut woodland (about 15 mature walnut trees and one mature oak tree would be removed). Temporary impoundment of water behind the debris dam probably would produce a small change in habitat in the basin area, possibly eliminating a few coast live oaks growing below the 100-year floodline. This could result in an estimated 5 percent reduction in the wildlife-carrying capacity of the wildlife habitat within the project area (Reference FSEIS, 1983, USFWS, Draft Coordination Act Report, 1981). About 1.5 acres of riparian habitat and 2 acres of prime and unique farmland located at the mule ranch would be lost and replaced with a concrete channel downstream from I-5. The loss of the riparian habitat would greatly reduce the value of the area to wildlife, especially passerine birds and raptors. Between Wiley Canyon Road and Lyons Avenue, about 5 acres of sparsely vegetated earthen channel would be converted to concrete channel.

5.04 The impacts of plans E-3 and E-4 on the biological resources in the area are essentially the same. The plans would involve construction of a levee, an inlet structure, and 4200 feet of rectangular concrete channel. Placement of fill and construction of the channel would destroy about 5 acres of marginal riparian and upland vegetation from the inlet structure to Lyons Avenue. Approximately 1 acre of potentially valuable riparian habitat and 3 acres of pastureland would be destroyed by construction of the inlet structure and levee. The concrete channel would displace very little wildlife because only a few passerine birds and reptiles use the channel. Willow, mulefat and small cottonwood trees line the channel near the proposed inlet structure, and elimination of this habitat would cause a small loss of food and cover for area wildlife. Esthetic treatment would serve to reduce the overall project-related losses of habitat throughout the project area. The treatment would consist of 2.5 acres of native hydroseeding of grasses and ground cover along the channel, as well as planting native shrubs and trees (such as *Rhus* sp. and *Quercus agrifolia*). This vegetation would provide food and cover for wildlife in the project area and vicinity.

MITIGATION FOR BIOLOGICAL RESOURCES

5.05 Mitigation measures for Plans A and B would reduce the overall project-related losses by preserving 14.5 acres of wildlife habitat within the right-of-way area for the proposed debris basin. The area is composed of 2.7 acres of oak-walnut woodland adjacent to the southern side of the proposed debris basin, 3.5 acres of coastal sage scrub adjacent to the northern side of the proposed debris basin and 8.3 acres of riparian habitat upstream of the proposed debris basin. Of the 14.5 acres preserved, 6.1 acres of riparian habitat, 2.4 acres of walnut-oak woodland and .5 acres of coastal sage scrub will be revegetated in an attempt to increase its wildlife habitat value (fig. 2). The features of this mitigation package have been developed by the Corps of Engineers in coordination with the U.S. Fish and Wildlife Service, the California Department of Fish and Game, and the Los Angeles County Flood Control District. The above named agencies all concur with the mitigation measures as planned. Mitigation measures are outlined below and are discussed in greater detail in the Final Supplemental Fish and Wildlife Coordination Act Report 10 October 1984 (Appendix G).

a. To offset the loss of 2 acres of riparian habitat, 8.3 acres of riparian habitat will be preserved within the debris basin right-of-way. Of the 8.3 acres of riparian habitat, 2.6 acres along the northern bank of the streambed (riparian zone 1, fig. 1) would be graded and revegetated with native riparian plant species such as *Platanus racemosa* (western sycamore), *Populus fremontii* (Fremont cottonwood), *Quercus agrifolia* (coast live oak), *Salix lasiolepis* (arroyo willow) and *Sambucus mexicana* (Mexican elderberry). Included within the 8.3 acres of riparian habitat preserved, an additional 3.5 acres of riparian habitat (riparian zone 2, fig. 1) along the northern side of the graded and revegetated area would also be upgraded by the planting of *Platanus racemosa* (western sycamore), *Populus fremontii* (Fremont cottonwood), *Quercus agrifolia* (coast live oak) and hydroseeding. The hydroseed mixture would consist of *Artemisia californica* (California sagebrush), *Eriogonum fasciculatum* (California buckwheat), *Lupinus* spp. (lupine) and *Salvia mellifera* (black sage).

b. The disturbance of 4.5 acres of oak-walnut woodland would be offset by replacing with a mixture of one and five gallon trees, 5 trees of *Juglans californica* (California walnut) or *Quercus agrifolia* (coast live oak) for every tree of either species removed. The oak-walnut planting would be concentrated within 2.4 acres of low-density oak-walnut woodland along the southern side of the proposed debris basin right-of-way.

c. The revegetation of 0.5 acres of coastal sage scrub would blend the revegetated areas with the adjacent slopes to the north of the proposed debris basin. The revegetation would consist of hydroseeding using the same mixture discussed above.

d. To provide interim nest holes for cavity nesters, prior to the removal of any existing vegetation, 20 nest boxes would be attached to trees within the proposed debris basin project area or immediate vicinity.

e. Planted and contoured areas discussed in the Final Supplemental Fish and Wildlife Coordination Act Report would be regarded as experimental in nature and would be monitored for 2 years with respect to wildlife usage (reconnaissance level), and success of planting procedures.

5.06 Plan G, the nonstructural flood plain management plan, would have no impact on the biological resources in the project area. There would be no change in channel conditions; floodwalls would be built around existing structures to prevent damages. Because Plan G would have no impact on the biological resources in the project area, no mitigation measures for this plan were developed.

5.07 Plan H, the "no action" plan, would have no impact on the biological resources within the project area. Because Plan H, would have no impact on the biological resources in the project area, no mitigation measures for the plan were developed.

THREATENED AND ENDANGERED SPECIES

5.08 Plans E-3 and E-4 would have no impact on any rare, threatened or endangered species. The only area of suitable habitat for any of the species listed, slender-horned spine flower and lest Bell's vireo, (FWS endangered species office February 17, 1984 Appendix G) would be about 1500 feet upstream from any construction. These areas would be protected in the floodway if plan E-3 or E-4 is selected. Plans A and B would involve construction of a concrete channel through the area mentioned above. As a result of surveys conducted in October 1980 and May 1984, the COE determined that no rare or endangered species live in or use the project area. Plans G and H would have no impact on any rare, threatened or endangered species.

PALEONTOLOGICAL AND CULTURAL RESOURCES

5.09 Plans A and B involve construction of a debris dam between the hillsides of Towsley and Wiley Canyons. Although there is a fossil site in this vicinity, it was determined that these alternatives would have no known impact. No known cultural resources would be impacted.

5.10 Plans E-3 and E-4 would have no impact on the known paleontological resources in the project area. The only known fossil site near the project area is on a hillside north of Towsley Canyon and west of I-5. No known cultural resources would be impacted.

5.11 Plans G and H, the nonstructural and "no action" alternatives would have no impact on any known paleontological or cultural resources in the project area.

WATER QUALITY

5.12 Since the South Fork of the Santa Clara River flows intermittently, it is not anticipated that construction-related activity would result in significant impacts to receiving waters and existing water quality levels. Construction-related activity would not involve, or occur near, sources of

pollution; also contractor-purchased materials would be pollution free. The project would not violate water quality standards set by the State of California or the EPA.

The Clean Water Act of 1977 requires a Federal agency to evaluate the effects of discharge of dredged or fill material into waters of the United States as a result of construction in accordance with Section 404(b)(1) of the Act. A 404 water quality evaluation has been prepared for and is included in this EA as Attachment A.

GROUND WATER RESOURCES

5.13 Plans A and B would impact the ground water resources in the area. About 1.3 mile of streambed would be channelized, resulting in an annual loss of 37 acre-feet of ground water recharge (personal communication LACFCD; 9 October 1980). This would represent a loss of 1.68 percent of the total amount of ground water recharge from streambed infiltration in the South Fork region. Short-term impoundment (less than 24-hours) of water behind the debris dam would help mitigate for the loss of ground water recharge in the proposed concrete section of channel, while avoiding vector problems.

5.14 Channelization in plans E-3 and E-4 would eliminate about 4200 feet of streambed-recharge capability. According to a personal communication with staff of the Los Angeles County Flood Control District, one mile of concrete channelization in this area would result in an annual loss of approximately 28 acre-feet of ground water recharge. Plan E-3 or E-4 would therefore result in an annual loss of less than 28-acre-feet. Since the average annual ground water recharge from streambed infiltration in the region is 2200 acre-feet, the annual loss would be about 1.27 percent.

5.15 Plans G and H would have no impact on groundwater resources in the area because they do not involve channelization of any section of the streambed.

PRIME AND UNIQUE FARMLANDS

5.16 Construction of the debris basin for Plan A or Plan B would destroy approximately 1.8 acres of grassland and would probably limit the grazing in the area upstream from the debris basin. Plan A or Plan B would also involve the acquisition of 2 acres of pastureland located at the mule farm downstream from I-5. Construction of the project may also indirectly affect the remaining 18.5 acres of prime and unique farmland in the project area, as channelization of the South Fork would reduce the 100-year flood plain to the channel and allow development in the South Fork watershed.

5.17 Implementation of plans E-3 and E-4 would involve the purchase of the mule farm for construction of the levee and inlet structure. This land would be kept as an open space floodway and it could be leased back to the present owner for grazing and other non-structural uses.

5.18 Plans G and H would have no impacts on any prime and unique farmland.

DEVELOPABLE LANDS

5.19 Implementation of Plans A and B would involve construction of a debris basin at the junction of Wiley and Towsley Canyons, which would probably preclude further development upstream from this point. The plans for a low-density residential development of 48 dwelling units on 240 acres in Towsley Canyon that were discussed in the 1983 FSEIS have been abandoned (personal communication, Los Angeles County Regional Planning, Subdivision Section, 13 September 1984). This area is currently zoned as a floodway/flood plain (Santa Clarita Valley, Areawide General Plan, February 16, 1984). Plans A and B would remove one of the existing constraints on development within the South Fork watershed, as the 100-year flood plain would be reduced to the channel. As a result, channelization of the South Fork of the Santa Clara River may lead to increased development in the project area. Land downstream of the proposed debris basin would probably be developed in accordance with the February 16, 1984 Area-wide General Plan for the Santa Clarita Valley. Much of the present 100-year flood plain downstream of the proposed debris basin is zoned for low-medium-density residential (3.4 to 6.6 dwellings per acre). Implementation of plans E-3 and E-4 would preclude development in the 40 acres between I-5 and Wiley Canyon Road. This area would be maintained as an open-space floodway. This area is vacant now, but it is zoned for low-medium-density residential development. Implementation of plan G (the flood plain management plan) or plan H (the "no action" alternative) would restrict construction in the 100-year flood plain.

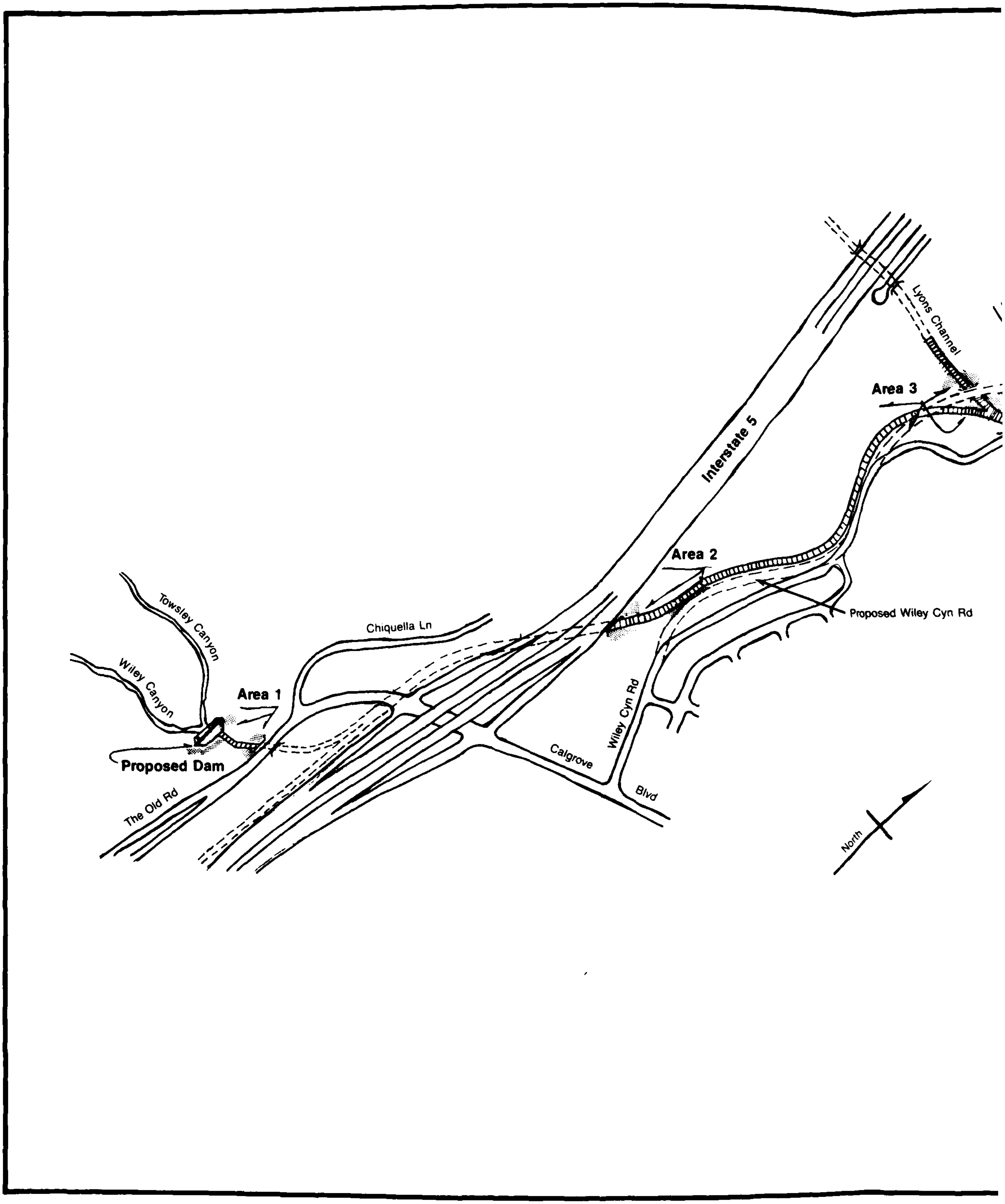
ESTHETICS

5.20 Esthetics in the area would be affected by the project alternatives, and there would be a few temporary impacts related to construction activities. These are discussed in the following paragraphs.

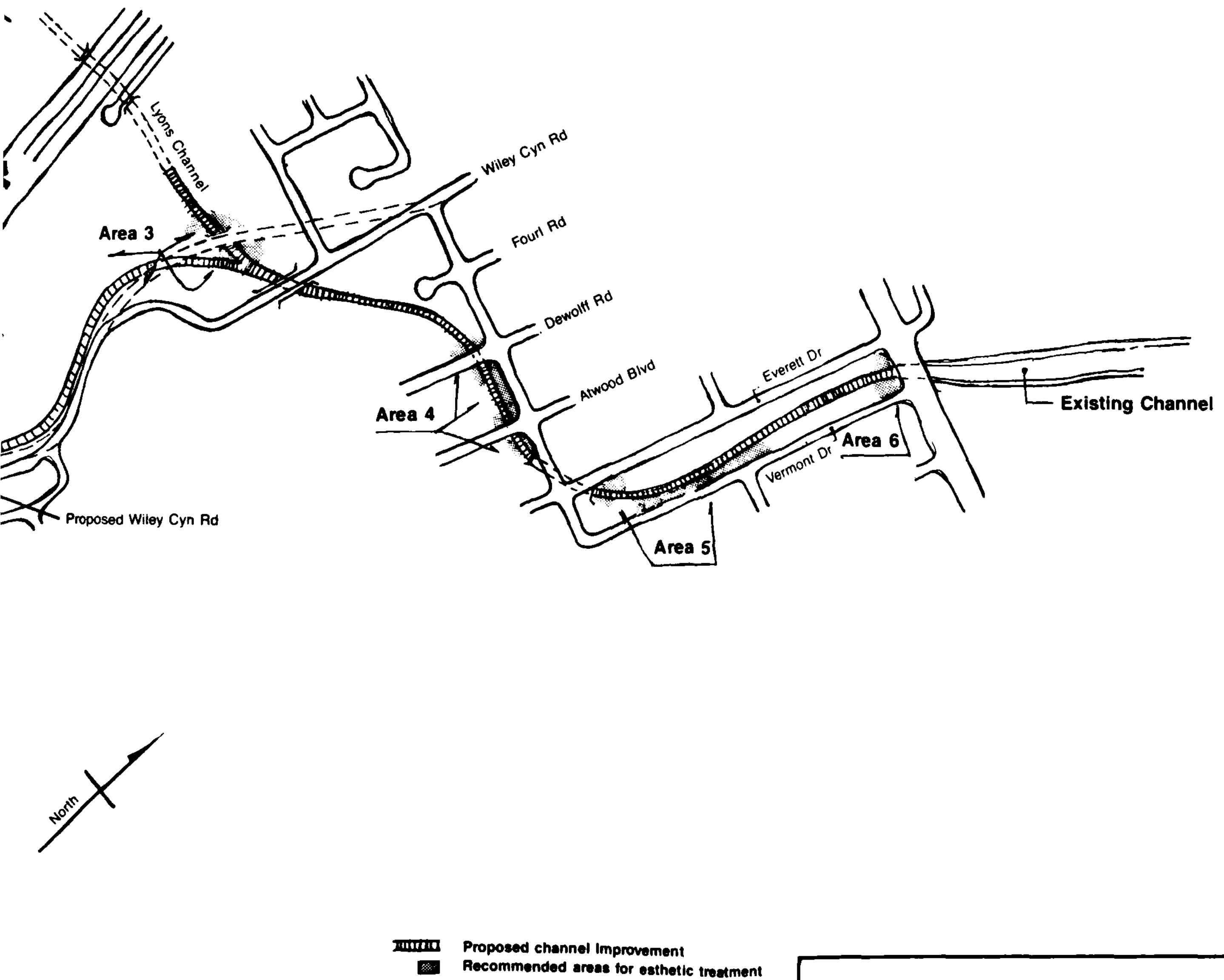
5.21 The debris basin (in plans A and B) would notably alter the visual esthetics of the area. The earthen structure would replace the pastoral setting. Channel improvements in undeveloped areas of the riverbed would replace the natural stream course with an obviously artificial concrete channel. Concrete channel improvements in the reach of existing flood control improvements (plans A, B, and E-3 and E-4) might improve the appearance of the area by removing unsightly debris and providing landscaping. Proposed landscaping along the channel and on the debris dam embankment would partially reduce the intrusiveness of the structure. The floodwalls around existing structures in plan G could have a negative esthetic appeal. Plan H, the "no action" alternative, would not impact the esthetics of the area.

ESTHETIC TREATMENT

5.22 An esthetic treatment plan has been designed for the South Fork of the Santa Clara River for the proposed channel and face of the debris basin (Fig. 3). The criteria used in selecting the esthetic treatment plan is based on the flood control project, and on environmental considerations. The plan would continue to be coordinated with the Los Angeles County Flood Control District and would provide the flood control project structures with the best feasible physical appearance all along the channel. Esthetic treatment would occur on lands acquired for the flood control purpose and would be developed as an integral part of the flood control project design.



Towsley Canyon
Wiley Canyon
Area 1
Proposed Dam
The Old Rd
Chiquella Ln
Interstate 5
Area 2
Area 3
Lyons Channel
Proposed Wiley Cyn Rd
Wiley Cyn Rd
Calgrove
Blvd
North



South Fork Santa Clara River,
Los Angeles County, California

PROPOSED
LANDSCAPE ESTHETIC
TREATMENT

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

EA-FIGURE 3

1

2

ESTHETIC TREATMENT LOCATION AND DESCRIPTION

5.23 Project esthetic treatment would occur on project right-of-way land adjacent to the channel structure and service road. Esthetic treatment would consist of landscape planting with minimal supporting irrigation. The main landscape concept would provide a landscaped strip adjacent to the channel through residential and undeveloped areas in the project area. The concept purpose would be to provide the following environmental factors:

(1) Landscape screening to minimize the visual harshness of the project channel structure.

(2) Landscape beautification in an area considered in need of visual upgrading.

(3) Planting of native species, to re-establish the once existing natural environment of the area and to identify with the existing surrounding natural oak-woodland hillside terrain.

(4) Dust and erosion control.

The landscaped strip would consist of an overall low-maintenance, hydroseeded and planted, non-irrigated reach. Additionally, selected street intersections would be landscaped with native drought-tolerant plants. The length of the landscaped strip, overall, would be approximately 4200 L.F. (linear feet) on both sides of the channel while the right-of-way width would average 20 L.F. on both sides with 16-foot wide service roads on both sides between IH-5 and station 19+00. Downstream of station 19+00 and upstream of the freeway, a service road will be provided.

ESTHETIC TREATMENT FEATURES

5.24 Landscape plantings would consist primarily of a native, drought tolerant, hydroseeded mix of various grasses, groundcover, and shrubs (see partial plant list). Additional one-gallon shrub plantings of the same species as the seed mix would be used to ensure plant groupings at desirable locations. Five gallon size native coast live oak trees would be used as the dominant tree throughout the project reach. The native plant materials, especially the oaks, would provide vegetation in the project area, complementing the surrounding hillsides. The trees and shrubs would, in many instances, be planted in groups for spatial definition and for visual screening. The plant material throughout the overall reach would be drought tolerant requiring no irrigation other than for establishment; also the deep rooting qualities of the material would provide good soil stability. The reach planting would be used at a rate of one additional one-gallon shrub per 20 L.F., and one 5-gallon tree per 40 L.F. All overall reach plant species would have minimal maintenance requirements because they are capable of survival under local climatic conditions without periodic watering.

5.25 Planting of native, drought-tolerant plants at selected areas would be additional to the reach landscape plantings. The plant "nodes" would be approximately 75 L.F. long by the width of the right-of-way, and be adjacent

to selected street crossings where channel visibility is greatest to minimize the visable harshness of the channel structure. The plant material here would be more varied, more interesting in form and color, and larger in original size, a mixture of 5- and 15-gallon trees would be used, in order to better minimize the visual harshness of the channel. Primarily native, drought-tolerant plant species would be planted; however, some non-native ornamental plant species with esthetic and wildlife value may be used. Irrigation would be required, although a simple quick coupler/hose watering system for plant establishment and permanent periodic irrigating is all that would be necessary. Deciduous California sycamore would be the dominant tree in these areas because it is indigenous to the once natural streambed, and would contrast desirably in form and color with the evergreen oak trees. The sycamore trees would be 15 gallons in size, planted at the rate of one tree per 30 L.F. used along with larger size typical reach shrubs, including 5-gallon Rhus (sumac) and Heteromeles (toyon) species, planted at the rate of one shrub per 5-10 L.F. The street intersections where the plant nodes would occur are at:

a. Lyons Avenue (On two corners-south side of street)

b. Evans Drive (All four corners)

c. Everett Drive (All four corners)

d. Atwood Boulevard (All four corners)

e. De Wolfe Road (All four corners)

f. Fourl Road (All four corners)

Additionally, again to minimize the visual harshness of the channel, the nodal plantings would extend the entire distance where the channel right-of-way parallels adjacent roads. This situation occurs along the channel's east side next to Vermont Drive, and on the channel's north side next to Powell Drive between De Wolfe Road and Atwood Boulevard.

5.26 All landscape plantings along the channel would meet engineering requirements specified in EM 1110-2-301, "Landscape Planting at Floodwalls, Levees and Embankment Dams," dated 29 December 1972. These requirements specify a minimum root-free zone of 3 feet from the channel.

5.27 The project esthetic treatment concepts described have been coordinated with the Los Angeles County Flood Control District. Coordination and local agency concurrence with the plan will be completed during review of this draft report. Operation, maintenance, and replacement would be a local responsibility.

RECOMMENDED PLANT LIST

The following is a list of the plant species intended for esthetic treatment and erosion control for the South Fork Flood Control Project. The species selected are drought-tolerant California natives suited for survival in this region. Actual sizes, quantities or species of plants may change depending on availability. Any substitution or changes will need to be coordinated with the project manager to insure appropriateness for the project.

Trees:

Platanus racemosa	California Sycamore
Populus fremontii	*Fremont Cottonwood
Quercus agrofolia	Coast Live Oak
Juglans californica	California Walnut

Shrubs (large):

Heteromeles arbutifola	Toyon
Rhus ovata	Sugar Bush
Rhus laurina	Laural Sumac

Shrubs (small):

Arctostaphylos densiflora	Vine Hill Manzanita
Artemisia californica	California Sagebrush
Eriogonum fasciculatum	*California Buckwheat
Lupinus sp.	Lupine
Salvia mellifera	Blacksage

Hydroseed Mixture:

Rhus Ovata	Sugar Bush
Artemisia californica	California Sagebrush
Eriogonum fasciculatum	*California Buckwheat
Lupinus sp.	Lupine
Salvia mellifera	Blacksage
Stipa pulchra	Purple Stipa
Eschscholzia californica	California Poppy
Baccharis pilularis	Dwarf Coyote Brush

*To be used in mitigation area only.

SHORT-TERM CONSTRUCTION

5.28 Construction would take approximately 18 months. The construction phase of the project would cause temporary air pollution in the form of increased particulates such as dust. This impact would be minimized, however, because the construction specifications will require that the contractor comply with

Federal, State, and local laws and regulations for control of dust. Stabilization methods include sprinkling, chemical treatment, light bituminous treatment, or similar measures. Temporary noise pollution, such as the loud noise made by large earthmoving equipment, would also occur during construction. Wildlife might be stressed and displaced by the noise of heavy construction equipment. The human inhabitants from nearby developed areas may also find the noise of heavy construction highly objectionable. Materials and construction equipment may need to be stored, and storage areas close to the construction site would be desirable. These areas would be on or near the construction site. Construction equipment and travel by workers would increase traffic near the construction site; and detours around bridge construction would increase traffic congestion along the detour route. Traffic would be rerouted through those roads remaining open (Everett Drive, Atwood Blvd., De Wolfe Road) while work on each bridge takes place. Excess material that would not be required for construction would be disposed of at an existing landfill or at a site selected by the contractor and approved by the Corps. An environmental assessment would be prepared prior to approval of a disposal site other than existing landfills. The perched water table in the proposed debris basin area should not cause problems during excavation or construction, as normal dewatering techniques should be sufficient to control the inflow.

LIST OF PREPARERS

6.01 The persons primarily responsible for the preparation and/or review of this final EA supplement to the 1983 Final Supplemental Environmental Impact Statement are listed in Table EA-2.

Table EA-2. List of Preparers.

Name	Expertise	Experience	Role in preparation of final EA supplement to the FSEIS
Terry Breyman	Ecology	Senior Ecologist, Corps 3 years	Review of biological sections.
Joe Donaldson	Landscape Architect	Landscape Architect, Corps, 2 years	Provided input on esthetic treatment plans
John Ferguson	Geology	Geologist, Corps 25 years	Provided geological information.
Lois Goodman	Botany	Botanist, Corps 4 years	Assisted in botanical survey.
Karen Helbrecht	Geography	Geographer, Corps 3 years	Assisted in Coordination
John Kennedy	Geography-Community Planning	Geographer, Corps 9 years	Supervisory Review
Gloria Lauter	Archeology	Archeologist, Corps 2 months	Surveyed project area and wrote cultural resource sections.
Adolfo Reyes	Civil Engineer	Civil Engineer, Corps 8 months	Provided information on project alternatives.
Bill Porter	Ecology	Ecologist, Corps 6 months	Coordinated mitigation plans and wrote biological sections of DEA.
Mark Tabor	Landscape Architect	Landscape Architect, Corps, 1 year	Preliminary design of mitigation plan

Table EA-2. List of Preparers (Continued)

Name	Expertise	Experience	Role in preparation of final EA supplement to the FSEIS
Laura Tschudi	Geography	Geographer, Corps 9 years	Technical Review Role in preparation of draft EA supplement
Julia Witz	Geography	Geographer, Corps 1-1/2 years	Coordinated and wrote DEA.

PUBLIC INVOLVEMENT

7.01 The public's involvement in project planning is discussed below.

PUBLIC INVOLVEMENT PROGRAM

7.02 A South Fork Citizens Advisory Committee was formed on 29 September 1975 to help the Corps in developing alternative solutions to the flood problems along the South Fork. All interested citizens were invited to join the committee. Most committee members were residents of the Newhall and Valencia areas. Eight workshop meetings were held from 1975 to 1980 and information brochures were distributed to the public in December 1975 and in February 1980 to describe the alternatives. In 1977 the local sponsoring agency (The Los Angeles Flood Control District) withdrew its support for Plan A. Plan E-3 was then developed and tentatively selected as the recommended plan in the 1983 FSEIS. In 1983, the local sponsoring agency requested that Plan A be re-studied due to a lack of local public support for Plan E-3. Through this process, plan A (the debris basin/concrete channel plan) was tentatively selected as the recommended plan. The public involvement program is discussed in more detail in Appendix A FSEIS, 1983 entitled, "Public Involvement and Coordination with Other Agencies."

REQUIRED COORDINATION

7.03 The draft EA supplement to the 1983 FSEIS was distributed to Federal, State, and local governments, environmental groups, and interested individuals for review and comment in November 1984. This review process included the Environmental Protection Agency, the State Regional Water Quality Control Board (404(b) evaluation), the State Historic Preservation Officer (cultural resources), and resource agencies (wildlife mitigation and operation and maintenance programs). The draft and final supplements to the July 1981 final Fish and Wildlife Coordination Act Report with Fish and Wildlife Service recommendations, are contained in Appendix G. The Corps and LACFCD concur with the recommendations for the recommended Plan A.

STATEMENT RECIPIENTS

7.04 Agencies, groups, and individuals to whom the draft EA supplement to the 1983 FSEIS was sent for review and comment are listed below. Comments received during the public review period were responded to, and incorporated into the final EA supplement to the 1983 FSEIS where practicable. Comments that have been received by the Corps of Engineers are included in Appendix A.

Federal

Advisory Council on Historic Preservation

Council on Environmental Quality

Department of Agriculture
- Soil Conservation Service
  - District Conservationist
  - Area Conservationist
  - River Basin Planning Staff
- Forest Service

Department of Commerce
- National Weather Service
- Deputy Assistant Secretary and Director for Environmental Affairs
- National Marine Fisheries Service

Department of Defense

- U.S. Army Corps of Engineers, South Pacific Division

Department of Energy
- Office of Electric Power Regulation
- Representative, Region IX
- San Francisco Operations Office
- Secretary of Energy

Department of Health and Human Services
- Assist. Secretary
- Centers for Disease Control
- Regional Director

Department of Housing and Urban Development
- Administrator, Region IX
- Director, Los Angeles Area
- Federal Disaster Assistance Administration
- FIA
- Office of Comm. Planning and Development

Department of the Interior
- Bureau of Land Management
- Bureau of Outdoor Recreation
- Bureau of Reclamation
- Director, Office of Environmental Project Review
- Office of the Commissioner

Fish and Wildlife Service
Area Manager
Field Supervisor
Geological Survey
Heritage Conservation and Recreation Service, Pacific Southwest Region

Department of Transportation
Administrator Region IX
Coordinator for Water Resources
Federal Highway Administration

Environmental Protection Agency
Administrator, Region IX
Office of Environmental Review
Federal Emergency Management Agency

Federal Energy Administration

General Services Administration

Small Business Administration

State

Clearinghouse. The following state agencies, departments, and commissions are among the State offices to receive copies of the DEA through distribution from the clearinghouse and the State Resources Agency.

California Water Commission
Department of Fish and Game
Department of Parks and Recreation
Department of Water Resources
Historic Resources Committee
Public Utilities Commission
Regional Water Quality Control Board
State Lands Commission

Southern California Associations of Governments

Los Angeles County

Flood Control District
Forester and Fire Warden
Parks and Recreation
Regional Planning Commission
Road Department

Other Agencies

Castaic Lake Water Agency
Newhall County Water District
Santa Clarita Water Company
Southern California Edision Company
Southern California Gas
Southern California Water Company
Upper Santa Clarita Valley Soil Conservation District

Interested Groups and Individuals

Andel Engineering
Audubon Society
California Tomorrow
California Water Pollution Control Assn.
California Wildlife Federation
Canyon Country Chamber of Commerce
Friends of the Earth
League of Women Voters
The Nature Conservancy
Oakridge Homeowners Association
Old Orchard Homeowners Association
Placerita Canyon Nature Center
Sierra Club
Sam Smiser
Taylor Enterprises

Libraries

Bethlehem Lutheran Church
First Christian Church of Solemint
Housing and Urban Development Library
Library of Congress
Los Angeles Baptist College
Los Angeles County Library
Placerita Junior High School
State of California Library, Govt. Publications Section
University of California, Los Angeles
- Water Resources Center Archives
- University Research Library

Victor Gruen Center for Environmental Planning

Media

The Newhall Signal
Valley News

ATTACHMENT A

SECTION 404(b)(1)
WATER QUALITY EVALUATION

TO ACCOMPANY THE FINAL ENVIRONMENTAL
ASSESSMENT WHICH SUPPLEMENTS THE
SOUTH FORK, SANTA CLARA RIVER DETAILED PROJECT REPORT
FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

THE EVALUATION OF THE EFFECTS
OF THE DISCHARGE OF DREDGED OR FILL MATERIAL
INTO THE WATERS OF THE UNITED STATES
SOUTH FORK, SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA

INTRODUCTION. The following evaluation is provided in accordance with Section 404(b)(1) of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) as amended by the Clean Water Act of 1977 (Public Law 95-217).

1. PHYSICAL AND CHEMICAL COMPONENTS OF THE SITE.

a. Description of the proposed discharge of dredged or fill materials. The fill material would consist of poorly bedded unconsolidated gravel, sand and silt; and construction grade, pollution free, materials such as concrete. Approximately 118,000 cubic yards of material would be excavated from the 1.3 miles of channel. It is estimated that 75,000 cubic yards of this earth fill would be used as backfill for the channel. The remaining 43,000 cubic yards would be disposed of by the contractor. The contractor would be responsible for evironmental clearance of the selected site. About 11,500 cubic yards of concrete would be needed for construction of the channel, and this material would be purchased from nearby suppliers. About 208,000 cubic yards of earth fill would be needed for the debris basin embankment.

b. Description of the proposed discharge sites for dredged or fill material. The proposed flood control project would be constructed on the South Fork of the Santa Clara River, which only flows intermittenly. The project area is located in Los Angeles County, California. The local flood control features would be replaced by a debris basin at the junction of Towsley and Wiley Canyons; a rectangular concrete channel about 650 feet in length, from the downstream end of the proposed debris basin spillway to the Old Road crossing; a rectangular concrete channel about 1.2 miles long from I-5 downstream to Lyons Avenue; the addition of two feet of freeboard to the existing flood control channel downstream of Lyons Avenue for a distance of 3050 feet; new bridges at Atwood Boulevard and DeWolfe Road which would be built to replace dip crossings; and additional bridges at Lyons Channel and where the new route of Wiley Canyon Road crosses the channel 2100 feet downstream of I-5. The discharge sites for fill material would be the debris basin embankment and backfill for the proposed concrete channel. The fill material would be discharged by conventional methods and construction will take approximately 18 months. The discharge sites should require no future modifications after completion of the proposed project.

2. POTENTIAL IMPACTS ON BIOLOGICAL CHARACTERISTICS OF THE AQUATIC ECOSYSTEM.

Construction of the proposed flood control project (Plan A) would involve construction of a debris basin and concrete channel downstream to Lyons Avenue (see fig. 2). Construction of a debris basin would eliminate 1.8 acres of grassland habitat, and about .5 acres of riparian habitat and disturb about 4.5 acres of oak-walnut woodland (about 15 mature walnut trees and 1 mature oak tree would be removed). Temporary impoundment of water behind the debris

dam probably would produce a small change in habitat in the basin area, possibly eliminating a few coast live oaks growing below the 100-year floodline. This could result in an estimated 5 percent reduction in the wildlife-carrying capacity of the habitat. About 1.5 acres of riparian habitat and 2 acres of prime and unique farmland located at the mule ranch would be lost and replaced with a concrete channel downstream from I-5. The loss of the riparian habitat would greatly reduce the value of the area to wildlife, especially passerine birds and raptors. Between Wiley Canyon Road and Lyons Avenue, about 5 acres of sparsely vegetated earthen channel would be converted to concrete channel. No fish are known to exist in the South Fork of the Santa Clara River within the project area, but there are several species of amphibians and reptiles. Coyote, mule deer and several species of rodents inhabit the overall project area. Loss of the riparian vegetation that would be destroyed during construction of the channel would have an adverse impact on the surrounding biological environment but can be offset by mitigation. Esthetic and mitigation treatments would reduce the overall project-related losses of habitat throughout the project area. The esthetic treatment would consist of approximately 2.5 acres of native hydroseeding of grasses and ground cover along the channel, as well as planting native shrubs and trees (such as Quercus agrifolia and Rhus sp.). Mitigation measures for Plan A include the preservation of about 8.3 acres of riparian, 2.7 acres of walnut woodland, and 3.5 acres of coastal sage habitat within the project right-of-way adjacent to and upstream of the debris basin. Of this area, 6.1 acres of riparian habitat, 2.4 acres of walnut-oak woodland and .5 acres of coastal sage scrub would be enhanced to increase its wildlife value. Mitigation measures also include installation of nest boxes, and a two-year monitoring program. Refer to section VIII of this report for a more detailed description of the proposed mitigation measures. The esthetic and mitigation treatments would provide food and cover for area wildlife.

3. POTENTIAL EFFECTS ON HUMAN USE CHARACTERISTICS. The proposed discharge of fill material would have no significant impact on the municipal water supply, and there would be an insignificant impact on any informal recreation uses of the channel (there are no formal recreation uses of the channel on this reach of the river). Any wildlife utilizing habitat within the proposed discharge areas would be displaced, but the esthetic treatment would probably provide replacement habitat. The project is not anticipacted to have any impacts on any threatened or endangered species of wildlife. Discharge would not be placed on or near wetlands; no submerged vegetation of biological signficance would be affected by the project. There are no parks, national or historic monuments, national seashores, wilderness areas, research sites or similar preserves which would be impacted by this project.

4. EVALUATION AND TESTING.

a. The material proposed for discharge meets the exclusion criteria. The earth fill would be taken from the project area, and would be substantially the same as the substrate at the proposed disposal sites. All earth material would be taken from sites sufficiently removed from sources of pollution to provide reasonable assurance that such material has not been contaminated by such pollution. All purchased construction materials would be pollution-free.

b. Total sediment analysis. Not applicable.

c. Biological community structure analysis. Not applicable.

d. Placement of fill would not violate Environmental Protection Agency or State of California water quality standards. Use of the material would not introduce toxic substances into the South Fork of the Santa Clara River.

e. Material meets Environmental Protection Agency exclusion criteria (see para. 3). The earth fill is substantially the same as the material at the deposition site.

5. ACTION TO MINIMIZE ADVERSE EFFECTS.

a. Need for the proposed activity. The proposed flood control project is necessary to provide residents of Newhall with protection against the Standard Project Flood from the South Fork of the Santa Clara River.

b. Alternative sites and methods of discharge were considered. Several alternative plans for flood control solutions were evaluated by the Corps during preliminary planning. These alternatives include dams, diversion channels, debris deposition area, other channel configurations and a non-structural flood plain management plan. These other alternatives either proved too costly or did not provide significant measurable flood protection.

c. Construction of the proposed debris basin and 1.3 miles of concrete channel would destroy about 2 acres of riparian habitat, 2 acres of prime and unique farmland, 1.8 acres of grassland habitat, and about 4.5 acres of walnut woodland and associated shrubland (approximately 15 mature walnut trees and 1 mature oak within the 4.5 acres would be removed). However, the esthetic treatment plan and mitigation plans would increase diversity of vegetation and, as a result, provide food and cover for a variety of wildlife species. The project esthetic treatment plan would occur on project right-of-way land adjacent to the channel structure and service road. The main landscape concept would provide a landscaped strip adjacent to the channel through residential and undeveloped areas in the project area. The concept purpose would be to provide the following environmental factors:

(1) Landscape screening to minimize the visual harshness of the project channel structure.

(2) Landscape beautification in an area considered in need of visual upgrading.

(3) Planting of native species, to re-establish the once existing natural environment of the area and to identify with the existing surrounding natural oak-woodland hillside terrain.

(4) Dust and erosion control.

The landscaped strip would consist of an overall low-maintenance, hydroseeded and planted, non-irrigated reach. Additionally, selected street intersections would be landscaped with native drought-tolerant plants. The length of the landscaped strip, overall, would be approximately 4200 L.F. (linear feet) on both sides of the channel while the right-of-way width would average 20 L.F. on both sides with a 16-foot wide service road on the west side only.

Mitigation plans include the preservation of approximately 14.5 acres of land within the project right-of-way adjacent to and upstream of the proposed debris basin. Approximately 6.1 acres of riparian, 2.4 acres of walnut-oak woodland and .5 acres of coastal sage scrub habitat of the 14.5 acres will be enhanced, resulting in the preservation of 8.3 acres of riparian, 3.5 acres of coastal sage, and 2.7 acres of walnut-oak woodland habitat. A two-year monitoring program and bird nest boxes are also included in the proposed mitigation plan. Construction activities would cause a temporary increase in turbidity as vehicles and personnel move in and along the channel. The construction contractor would provide for onsite retention of construction wastewater. The concrete channel would also be esthetically less pleasing than the natural channel, but the environmental enhancement would reduce the visual impact. Construction of the project would result in esthetic impacts, but these would be short-term. No rare or endangered species would be impacted by the proposed discharge of fill. The following flood control measures were investigated during preliminary planning: (1) In 1976, plan A was the tentatively selected plan, and it was endorsed by the area residents and the local sponsoring agency (The Los Angeles County Flood Control District). The Los Angeles County Flood Control District withdrew its support for the selected plan in 1977, raising questions on the viability of the proposed debris basin at the junction of Wiley and Towsley Canyons. (2) Plan E-3 was then developed and tentatively selected as the recommended plan in the 1983 FSEIS, at which time a 404 water quality evaluation was prepared. (3) In 1983, the local sponsor requested that Plan A be re-studied due to a lack of local support for Plan E-3. Plans for developing the upstream area for housing have been abandoned, thereby allowing the acquisiton of rights-of-way to be more economically feasible. In addition, the 25-acre parcel of land that was recommended for a debris deposition area downstream of I-5 under Plan E-3, has now become less desirable for use as a flood control feature because right-of-way costs would be prohibitive because of the land's prime location and possible future uses. Plan A is currently the recommended plan and has been modified slightly from the Plan A that was presented in the January 1983 FSEIS. The low-flow diversion channel that was included as mitigation in the previously described Plan A (1983 FSEIS) has now been deleted from the current plan and a new mitigation plan has been developed to compensate for the loss of wildlife habitat that would result from the implementation of Plan A.

d. Impacts on water uses at proposed discharge site (40 CFR 230.5(b)(1-10) are as follows: The proposed discharge of fill material would have no significant impact on the municipal water supply, and there would be an insignificant impact on any informal recreation uses of the channel (there are no formal recreation uses of the channel on this reach of the river). Any wildlife utilizing habitat within the proposed discharge areas would be displaced, but the esthetic treatment and mitigation plans would probably provide replacement habitat. The project is not anticipated to have any

impacts on any threatened or endangered species of wildlife. Discharge would not be placed on or near wetlands; no submerged vegetation of biological significance would be affected by the project.

e. Considerations to minimize harmful effects (40 CFR 230.5(c)(1-7)). All necessary factors were considered in determining the site and disposal conditions to minimize the possibility of harmful effects. Five alternatives to the proposed plan were investigated, and detailed descriptions of these plans are contained in the main report. A brief description of each follows:

(1) Plan B is essentially the same as Plan A, but the concrete channel has been scaled down to accommodate the 100-year flood. The mitigation measures are also the same as in Plan A.

(2) Plan E-3 is designed to contain flows from the standard project flood. It would provide for a debris deposition area between I-5 and the channel inlet structure, construction of an inlet structure 600 feet upstream from the Wiley Canyon Road bridge, and construction of a 4200-foot-long rectangular concrete channel from the inlet to Lyons Avenue. A 600-foot-long levee would be built from the inlet structure to I-5 and new bridges would be built to replace dip crossings at Atwood Boulevard and Dewolfe Road. An additional flood control feature is a low-flow channel which would serve to support the existing riparian growth between I-5 and the inlet structure. Esthetic treatment for this plan includes planting a greenbelt of native drought-tolerant plant species along the proposed channel right-of-way from the inlet structure to Lyons Avenue.

(3) Plan E-4 is the Environmental Quality (EQ) plan, and is essentially the same as plan E-3 except that it has been scaled down to accommodate the 100-year flood. Plan E-4 has the highest benefit/cost ratio and it is the National Economic Development (NED) plan.

(4) Plan G, the flood plain management plan, is a nonstructural solution to the flood problem. Flood walls would be constructed around existing structures and future development would be restricted in the 100-year flood plain. The existing resources on the South Fork of the Santa Clara River will not be affected by this plan.

(5) The no-action alternative, Plan H, will not affect the existing resources on the South Fork of the Santa Clara River.

6. CONCLUSION AND DETERMINATIONS. An ecological evaluation has been made following the evaluation guidance in 40 CFR 230.4, in conjunction with the evaluation considerations in 40 CFR 230.5. Appropriate measures have been identified and incorporated in the proposed plan to minimize adverse effects on the aquatic environment as a result of fill activities. Consideration has been given to the need for the proposed activity, the availability of alternate sites and methods of disposal that are less damaging to the environment, and such water quality standards as are appropriate and applicable by law. It was determined that the activity associated with the fill must have direct access or proximity to, or be located in, the water resources in order to fulfill its basic purpose.

7. FINDINGS. The fill placement sites for the South Fork of the Santa Clara River, Los Angeles California project have been specified through the application of the Section 404(b)(1) Guidelines.

APPENDIX A

PUBLIC INVOLVEMENT AND COORDINATION

WITH OTHER AGENCIES

January 1985

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INTRODUCTION

A detailed description of the public involvement program, including all coordination and correspondence leading to publication of the January 1983 Final Detailed Project Report, may be found in Appendix A of that report. Since these items remain accurate and relevant, they will not be discussed in this supplemental appendix.

This supplement to Appendix A does address all coordination occurring since receipt by the Corps, of the September 1, 1983 letter from the local sponsor requesting a change in the Final DPR design. Comments and responses resulting from public and interagency review of the Draft Supplement to Final DPR, dated November 1984, are also included.

COORDINATION AND CORRESPONDENCE

The following correspondence includes letters of local coordination between the Corps and the Los Angeles County Flood Control District (Exhibits 1, 2, 4, 5), and a Draft "221" Agreement of Local Support (Exhibit 3). Public comments and responses to the November 1984 Draft Supplement to the Final Detailed Project Report follow the exhibits.

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
P. O. BOX 2418, TERMINAL ANNEX
LOS ANGELES, CALIFORNIA 90051

HOWARD H. HAILE
CHIEF ENGINEER

TELEPHONE 226-4105

September 1, 1983

IN REPLY PLEASE REFER TO
FILE NO. 337.60
Santa Clara River-South Fork
Project Information

Col. Paul W. Taylor
District Engineer
Department of the Army
Los Angeles District, Corps of Engineers
P.O. Box 2711
Los Angeles, CA 90053

Dear Colonel Taylor:

We have reviewed the Final Detailed Project Report on the South Fork of the Santa Clara River dated January 1983 that recommends Plan E-3. As you know, there is an urgent need for flood control in this area and we would like to reiterate our support for a project. Studies on this reach have been ongoing for some time, and we are quite pleased that the report is being completed and definite progress is being made. As the local sponsoring agency, we would like to assure you of both our cooperation and intent to provide whatever is possible in order to maintain momentum towards getting this project built as soon as possible.

In light of this, the District has been working diligently to secure local funding so that construction may begin as soon as possible. We have also been exploring the possibility of design modifications to Plan E-3, as indicated in our letter of December 29, 1982. These modifications consist of extending the channel about three-quarters of a mile. A debris basin would be constructed at the junction of Wiley and Towsley Canyons. This configuration would be very similar to Plan A as described in the Detailed Project Report. Your report shows Plan A is economically justified, and has been coordinated amongst the public and environmental agencies, the State Department of Fish and Game, and the U.S. Fish and Wildlife Service. Contrary to early understandings, there are now indications of greater support from the surrounding residents for this plan.

This modification, as we envision it, would be compatible with the channel work proposed in Plan E-3 and would connect to that channel. These changes may require a revision to the Detailed Project Report and we are willing to work with the Corps to determine what assistance may be needed from us to help expedite this process. This would include discussing the possibility of funding any Supplemental Report. We understand that for any project considered, the Corps' total financial contribution for design, pertinent studies, and construction is limited to $4 million. Because this modification will increase the overall project cost, we realize that local financial participation will increase to account for this difference. In order to expedite the project, we would be willing to design the upstream portion according to Corps' standards and pursuant to your review.

2250 ALCAZAR STREET, LOS ANGELES

EXHIBIT 1

The benefits of adopting this modified plan include financial participation by the local landowners that would benefit from the change. This serves to lower the Flood Control District's cost even though the total cost of the plan is higher than that of Plan E-3. Moreover, the modified plan would represent a local cost sharing percentage of approximately 60 per cent as compared with the 40+ per cent local cost sharing that could exist with Plan E-3. Finally, we feel that the plan offers a more logical design by keeping debris upstream of the freeway and preventing flows from cascading over the freeway and down Calgrove Boulevard.

We appreciate the efforts of your agency in pursuing this modification. We realize that this is a late change, yet we do not want to delay the project and are willing to cooperate in adhering to the current schedule, which calls for construction to begin during the spring of 1985. For construction to begin in early 1985, the District must make its financial recommendation for our 1984-85 (July 1, 1984 - June 30, 1985) Budget by November 1, 1983. We would like to meet with you and your staff on this at your earliest convenience.

Should you have any further questions regarding this matter, please contact me or Mr. Rusty Reed, Project Manager, at 226-4059.

Yours very truly,

KWKummerfeld

K. W. Kummerfeld
Assistant Chief Deputy Engineer

RRR:tf

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

xxxxxxxxxxxx

November 14, 1984

TELEPHONE (213) 226-4321

IN REPLY PLEASE REFER TO
FILE NO. 337.41
Santa Clara River-South Fork
Review of Corps of Engineers'
Draft Project Report and
Environmental Assessment

Col. Dennis F. Butler
District Engineer
Department of the Army
Los Angeles District, Corps of Engineers
P.O. Box 2711
Los Angeles, CA 90053

Dear Colonel Butler:

We have reviewed portions of your draft Supplement to the Detailed Project Report on the South Fork of the Santa Clara River. We strongly support Plan A as recommended in the report because the project provides the comprehensive flood control solution and proper level of protection. We request that you continue processing the report and prepare specifications for Plan A. We will continue to provide the necessary support as the local cooperating agency. We understand that you are planning for a spring 1985 advertising date depending, of course, upon availability of funding.

We have contacted various property owners regarding the acquisition of right of way and anticipate certification of all right of way by the date of contract advertisement.

We are preparing the necessary documents for the required environmental approvals and coordinating these activities with your staff.

Should you need additional information, please contact Mr. Michael Morris, Project Manager, at (213) 226-4065.

Yours very truly,

Carl L. Blum

Carl L. Blum, Division Engineer
Program Management Division

MAM:kdl

EXHIBIT 2

2250 ALCAZAR STREET LOS ANGELES

DRAFT AGREEMENT

THIS AGREEMENT entered into this ________ day of ________, 19___, by and between the UNITED STATES OF AMERICA (hereinafter called the "Government"), represented by the Contracting Officer executing this Agreement, and the County of Los Angeles Board of Supervisors (hereinafter called the "County"),

WITNESSETH THAT:

WHEREAS, construction of the South Fork of the Santa Clara River Flood Control Project (hereinafter called the "Project") was authorized by the Chief of Engineers, U.S. Army on the ________ day of ____________, 19___; and in accordance with Section 205 of the 1948 Flood Control Act (PL 80-858) and its amendments; and

WHEREAS, the County hereby represents that it has the authority and capability to furnish the non-Federal cooperation required by applicable law;

NOW, THEREFORE, the parties agree as follows:

1. The County agrees that, if the Government shall commence construction of South Fork of the Santa Clara River Flood Control Project under the authority of Section 205 of the 1948 Flood Control Act and its amendments and substantially in accordance with the Detailed Project Report authorizing such work, the County shall, in consideration of the Government commencing construction of such Project, fulfill the requirements of non-Federal cooperation specified in applicable law, to wit:

a. Provide without cost to the United Stats all lands, easements, and rights-of-way necessary for the construction of the Project, including lands necessary for mitigation for Project effects. The minimum real estate interests to be acquired by the County are as follows:

(1) Fee title, or permanent easements, for levees, walls, other permanent structures, ponding areas, channel rectification works and adequate access thereto.

(2) Permanent easement for spoil disposal and borrow areas required for future maintenance work, and adequate access thereto.

(3) Permits or temporary easements for spoil, work or borrow areas required during construction, and adequate access thereto.

b. Where Federal costs for the entire Project exceed the limitation expressed in Section 205 of the 1948 Flood Control Act (PL 80-858) and its amendments, provide a cash contribution for the amount of excess.

c. As made necessary by construction, accomplish, without cost to the United States, all alterations and relocations of buildings, transportation facilities, storm drains, utilities, and other structures and improvements. This provision excludes railroad bridges and approaches, and facilities necessary for the normal interception and disposal of local interior drainage at the line of protection.

d. Maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of the Army.

e. Prescribe and enforce regulations to prevent obstruction or encroachment on flood control works which would reduce their flood carrying capacity or hinder maintenance and operation, and control development in the project area to prevent an undue increase in the flood damage potential.

f. The County hereby agrees that it will comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, approved January 2, 1971, in acquiring lands, easements, and rights-of-ways for construction and subsequent maintenance of the Project, and inform affected persons of pertinent benefits, policies, and procedures in connection with said Act. All records concerning acquisition under Title III of the Law and the offering of an payment of Title II benefits available under the Law are to be made available to the Government for review and approval.

g. Publicize flood plain information in the areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the flood plain.

h. Hold and save the United States free from water rights claims caused by the construction and operation of the Project.

i. Hold and save the United States free from damages due to construction, operation, and maintenance of the Project, excluding damages due to the fault or negligence of the United States or its contractors.

j. The County hereby gives the Government a right to enter upon, at reasonable times and in a reasonable manner, lands which the County owns or controls, for access to the Project for the purpose of inspection, and for the

purpose of repairing and maintaining the Project, if such inspection shows that the County for any reason is failing to repair and maintain the Project in accordance with the assurances hereunder and has persisted in such failure after a reasonable notice in writing by the Government delivered to the County official. No repair or maintenance by the Government in such event shall operate to relieve the County of responsibility to meet its obligations as set forth in Paragraph 1 of this Agreement, or to preclude the Government from pursuing any other remedy by law or equity.

k. This agreement is subject to the approval of the Chief of Engineers, U.S. Army.

IN WITNESS WHEREOF, the parties hereto have executed this contract as of the day and year first above written.

APPROVED AS REQUIRED UNDER SECTION 221 OF PUBLIC LAW 91-611, AS TO FORM AND AS TO LEGAL SUFFICIENCY:

____
County Counsel
County of Los Angeles

DATE: ____________________

THE UNITED STATES

BY __________________________
Colonel, Corps of Engineers
District Engineer
Contracting Officer

DATE: ____________________

COUNTY OF LOS ANGELES

BY __________________________
Chairman, Board of Supervisors

DATE: ____________________

ATTEST:

By __________________________
Clerk of the Board of Supervisors

DATE: ____________________

COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
2250 ALCAZAR STREET
LOS ANGELES, CALIFORNIA 90033

THOMAS A. TIDEMANSON, Director
HIAM BARMACK, Chief Deputy Director
JAMES L. EASTON, Chief Deputy Director
WYNN L. SMITH, Chief Deputy Director

Telephone (213) 226-4111
ADDRESS ALL CORRESPONDENCE TO
P.O. BOX 2418
LOS ANGELES, CALIFORNIA 90051

IN REPLY PLEASE REFER TO FILE 337.41

January 2, 1985

Col. Dennis F. Butler
District Engineer
Department of the Army
Los Angeles District, Corps of Engineers
P.O. Box 2711
Los Angeles, CA 90053

Attention Mr. Ira Arzt

Dear Colonel Butler:

SANTA CLARA RIVER-SOUTH FORK

In accordance with your recent letter, we have reviewed your Draft Supplement to the Final Detailed Project Report for the South Fork of the Santa Clara River. Our detailed comments on the report have been informally provided to Mr. Arzt of your staff. Comments on the draft "Section 221" Agreement are enclosed.

We must obtain the approval of the State Department of Water Resources, Division of Safety of Dams, for the operation of Towsley Debris Basin. Its approval process includes review of final construction plans and specifications. We have begun the application process and submitted preliminary plans. We would appreciate your staff considering any comments that the agency may have regarding the design of the debris dam.

Should you need additional information, please call Mr. Michael Morris, Project Manager, at (213) 226-4065.

Very truly yours,

Carl L. Blum

CARL L. BLUM, Division Engineer
Program Management Division

MAM:ca

Enc.

cc: Mr. Warren Hagstrom
Department of the Army
Los Angeles District, Corps of Engineers

EXHIBIT 4

ATTACHMENT I

Comments on "Section 221" Agreement

1. On page 2, Paragraph C, should indicate that relocation and alteration of bridges, utilities, storm drains, and other improvements will be included in the construction contract, as appropriate.

2. We anticipate assigning a Flood Control District inspector to oversee the construction operations. The Agreement should provide for this situation.

3. The Agreement should identify the responsible agency to obtain the necessary agency approvals and permits. The following approvals/permits are anticipated:

    a. Encroachment Permit from California Department of Transportation.

    b. Streambed Alteration Agreement from California Department of Fish and Game.

    c. Excavation Permit from County Road Department.

4. The Agreement should require the Flood Control District to review and approve the final plans and specifications prior to advertisement of the project.

MAM:as

AD-A186 575 SOUTH FORK OF THE SANTA CLARA RIVER SANTA CLARITA VALLEY CALIFORNIA SUPPLEMENT(U) ARMY ENGINEER DISTRICT LOS ANGELES CA JAN 85

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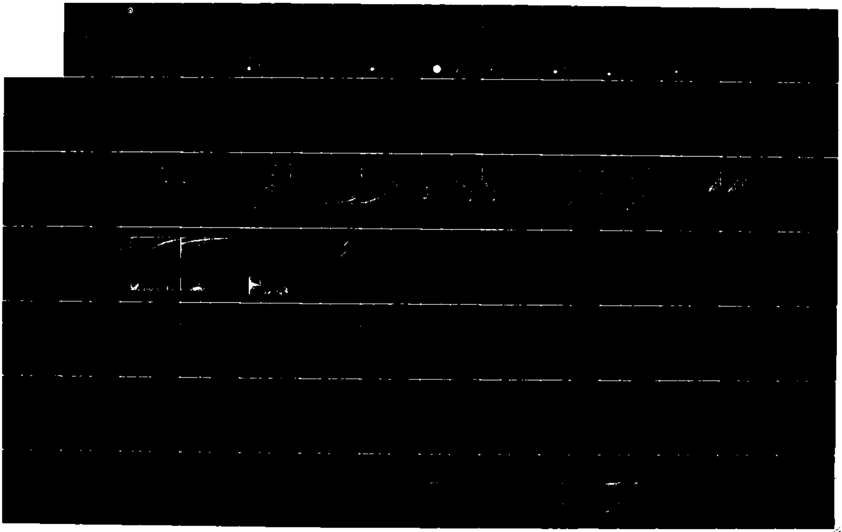

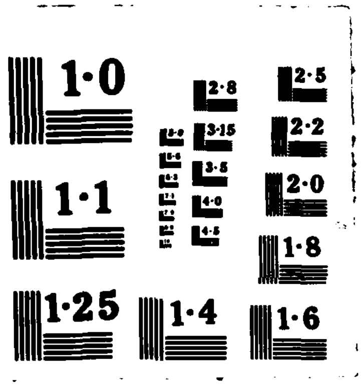
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DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS

January 22, 1985

REPLY TO
ATTENTION OF
SPLPD-WA

Mr. Carl L. Blum
Division Engineer
County of Los Angeles
Department of Public Works
2250 Alcazar Street
Los Angeles, California 90033

Dear Mr. Blum:

We have reviewed the County's comments on the South Fork Draft Supplement to the Final DPR, and Draft "221" Agreement, as outlined in your letter to the District Engineer, dated January 2, 1985. Corps responses to the detailed comments informally provided by your staff have been coordinated with Mr. Michael Morris of your staff. All comments on the report were discussed, and several have been incorporated in the report.

Although reviewed, comments regarding the Draft "221" Agreement are not herein addressed. The standard "221" document is included in the Detailed Project Report for information purposes. Refinement will be performed during the plans and specifications phase of the project.

We appreciate your concerns and efforts with respect to State Department of Water Resources project approvals, and will consider any comments submitted to us by them. If we may be of any further assistance at this time, please don't hesitate to contact Mr. Ira Arzt of my staff, at (213) 688-5465.

Sincerely,

Carl F. Enson
Chief, Planning Division

 EXHIBIT 5

COMMENTS AND RESPONSES

Page

1. Kaufman, Nancy M., U.S. Department of the Interior, Fish and Wildlife Service, letter dated, December 10, 1984.....A-14

2. Lewis, Carroll B., private citizen, letter dated, December 13, 1984.....A-15

3. Plummer, N.W., U.S. Department of the Interior, Bureau of Reclamation, letter dated, December 18, 1984.....A-16

4. Jinks, James E., Newhall County Water District, letter dated, December 26, 1984.....A-17

5. Tiller, Robert E., U.S. Department of Energy letter dated, December 27, 1984.....A-18

6. Port, Patricia S., U.S. Department of the Interior, Office of the Secretary, letter dated, January 3, 1985.....A-19

7. Englund, John W., County of Los Angeles Fire Department, letter dated, January 8, 1985.....A-20

8. Kisselburg, Willis Jr., U.S. Department of Transportation, Federal Highway Administration, Region Nine, letter dated, January 10, 1985.....A-21

United States Department of the Interior

FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
24000 Avila Road
Laguna Niguel, California 92677

December 10, 1984

Colonel Dennis F. Butler
District Engineer
Los Angeles District
Corps of Engineers
P.O. Box 2711
Los Angeles, California 90053-2325

Re: Draft Supplement to Final Detailed Project Report for the South Fork of the Santa Clara River, including Draft Environmental Assessment

Dear Colonel Butler:

The Fish and Wildlife Service (FWS) has reviewed the referenced document and offers the following comments.

During FY 84, the FWS and Corps of Engineers engaged in negotiations resulting in the proposed mitigation described in our Supplemental *Fish and Wildlife Coordination Act Report* and summarized in the Draft Environmental Assessment. The FWS, therefore, has no objections to the project as proposed. Any change in recommended mitigation or project design would require further discussion.

The FWS has appreciated the involvement we have had in this planning process. If you have any questions regarding these comments, please call Karla Kramer or me at FTS 796-4270.

Sincerely yours,

Wayne S. Hayes

for Nancy M. Kaufman
Field Supervisor

cc: CDFG, Reg. 5, Long Beach, CA
CE, Env. Section, Los Angeles, CA

NO RESPONSE REQUIRED

12-13-84

Department of the Army

Gentlemen

Recieved your letter of Dec 4.

I am very much concerned about the catch basin & drain into the wash.

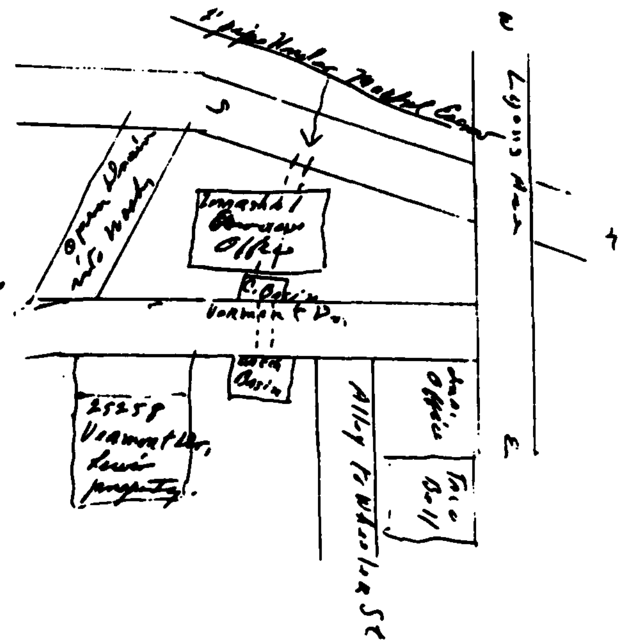
My property has been flooded 3 times in the last 3 yrs.

When the County rebuilt Vermont Dr. the road is graded so that in front of my property is the lowest side of the road

The street is appr. 6 to 10" lower on my side so that 90% of the water flows to my side.

The basin is plugged up every fall so the first rain comes the basin has to be cleaned out.

The first rain this year was Nov 11 PM.



2

I had called the County 4 days before asking them to clean out the basin. They did not come.

One oclock A.M. I had to go out and open the basin to avoid flooding my property.

It is my understanding that the flood control will not service this drain because it is not built to your specs. ①

When I contacted flood control 3 years ago they came and inspected the basin & drain.

At that time flood control had no record of the catch basin and drain

Yours Truly
Carroll B. Lewis

Response to December 13, 1984 letter from Carrol B. Lewis, local resident.

① The Corps of Engineers has received your inquiry on this subject in the past, and has passed it on to the Los Angeles County Department of Public Works, for action. The drain in question is County-built and must be County-maintained. It is not included in the scope of the herein proposed South Fork project; however, the County has maintenance responsibilit for the project, including the insurance that side drainage will be kept clear so that the project can function in reducing local flooding.

United States Department of the Interior

BUREAU OF RECLAMATION
LOWER COLORADO REGIONAL OFFICE
P.O. BOX 427
BOULDER CITY, NEVADA 89005

IN REPLY REFER TO: LC-230
770.

DEC 18 1984

Colonel Dennis F. Butler
District Engineer
Los Angeles District
Corps of Engineers
P. O. Box 2711
Los Angeles, California 90053-2325

Attention: SPLPD-MA

Dear Colonel Butler:

We appreciate your sending the Draft Supplement to the Final Detailed Project Report for the South Fork of the Santa Clara River for our review.

We see no conflict with our responsibilities and have no adverse comments.

Sincerely yours,

John D Brown

ACTING FOR
N. W. Plummer
Regional Director

NO RESPONSE REQUIRED

NEWHALL COUNTY
WATER DISTRICT

December 26, 1984

Department of the Army
Los Angeles District
Corps of Engineers
P. O. Box 2711
Los Angeles, Ca 90053-2325

Attention: Dennis F. Butler

Subject: South Fork of the Santa Clara River (Flood Control)

Gentlemen:

After review of the plans for the proposed flood control project we find the estimated loss of 28 acre feet to be acceptable in exchange for the benefit realized by the flood control protection.

1 Any relocation of existing district facilities as a result of flood control construction shall be at the expense of others.

Yours very truly,

NEWHALL COUNTY WATER DISTRICT

James E. Jinks
General Manager

JEJ/as

Response to December 26, 1984 letter from James E. Jinks, Newhall County Water District.

1 The Los Angeles County Department of Public Works will coordinate all utility relocations required as a result of the project, with the affected agency. Please see page 13, Table 3, of Appendix D for a description of utilities in the project area.

Department of Energy
Washington, D.C. 20585

DEC 27 1984

Colonel Dennis F. Butler
District Engineer
Department of the Army
Los Angeles District, Corps of Engineers
P.O. Box 2711
Los Angeles, California 90053-2325

Dear Colonel Butler:

The Secretary has asked me to respond to your letter of November 30, 1984, requesting our comments on the Draft Supplement to the Final Detailed Project Report (DPR) for the South Fork of the Santa Clara River.

The draft supplement describes the alternative selected to provide protection against the Standard Project Flood in the Santa Clarita Valley in northern Los Angeles, California.

NO RESPONSE REQUIRED

Based on our review of the documents, we do not believe the proposed action conflicts with our activities.

Robert E. Tiller
Acting Deputy Assistant Secretary for
Environment, Safety and Health

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF THE SECRETARY
PACIFIC SOUTHWEST REGION
BOX 36098 • 450 GOLDEN GATE AVENUE
SAN FRANCISCO, CALIFORNIA 94102
(415) 556-8200

JAN 5 1985

ER 84/1546

Colonel Dennis F. Butler
District Engineer, Los Angeles District
U.S. Army Corps of Engineers
P.O. Box 2711
Los Angeles, California 90053-2325

Dear Colonel Butler:

The Department of the Interior has reviewed the Draft Supplement to the *Final Detailed Project Report and Environmental Assessment* (EA), South Fork of the Santa Clara River, Los Angeles County, California.

The document adequately addresses areas of concern to this Department and we have no substantive comments to make.

During FY 84, the Fish and Wildlife Service (Service) and the Corps of Engineers engaged in negotiations resulting in the proposed mitigation described in the Service's June 22, 1984, Supplemental Fish and Wildlife Coordination Act Report (Pages G-9 to G-17 of EA Appendix). The Service, therefore, has no objections to the project as proposed. They request that further discussion be initiated if there are any changes in recommended mitigation or project design.

NO RESPONSE REQUIRED

Thank you for the opportunity to review this document.

Sincerely,

Patricia S Port

Patricia Sanderson Port
Regional Environmental Officer

cc: Director, OEPR (w/copy incoming)
Reg. Dir., FWS
Reg. Dir., NPS

COUNTY OF LOS ANGELES

FIRE DEPARTMENT

POST OFFICE BOX 3000, TERMINAL ANNEX
LOS ANGELES, CALIFORNIA 90051

267-2481

JOHN W. ENGLUND
FIRE CHIEF
FORESTER & FIRE WARDEN

January 8, 1985

Dennis F. Butler, Colonel
Los Angeles District, Corps of Engineers
Department of the Army
P. O. Box 2711
Los Angeles, CA 90053-2325

Dear Colonel Butler:

SUBJECT: DETAILED PROJECT REPORT (DPR)-SOUTH FORK OF THE SANTA CLARA RIVER

This project has been revised by our Department and the enclosed report from the Fire Protection Engineering Section responds to those areas which affect the Fire Department's responsibility and operation.

Very truly yours,

JOHN W. ENGLUND

By
ROBERT E. JOHNSON
HEAD DEPUTY FORESTER
FORESTRY DIVISION

REJ:lrt

Enclosure

SERVING THE UNINCORPORATED AREAS OF LOS ANGELES COUNTY AND THE CITIES OF

AGOURA HILLS, ARTESIA, AZUSA, BALDWIN PARK, BELL, BELLFLOWER, BRADBURY, CARSON, CERRITOS, CLAREMONT, COMMERCE, CUDAHY, GLENDORA, HAWAIIAN GARDENS, HIDDEN HILLS, HUNTINGTON PARK, LAKEWOOD, LA MIRADA, LANCASTER, LA PUENTE, NORWALK, PALMDALE, PARAMOUNT, PICO RIVERA, RANCHO PALOS VERDES, ROLLING HILLS, ROSEMEAD, SAN DIMAS, SIGNAL HILL, SOUTH EL MONTE, SOUTH GATE, TEMPLE CITY, WESTLAKE VILLAGE, WHITTIER

December 13, 1984

SUBJECT: SOUTH FORK OF THE SANTA CLARA RIVER

Our review of the subject indicates no adverse effect to fire protection if standard Fire Department requirements for fire hydrants, water mains, fire flow, access, and design are met.

All of the Fire Department requirements are addressed at the Los Angeles County Subdivision Committee meeting when approval for tentative subdivision maps are considered.

A fire prevention suggestion that will reduce potential fire and life losses would be the installation of sprinkler systems in the projects' residential dwellings. Systems are now technically and economically feasible for residential use.

Incorporating sprinkler protection with required smoke detection will greatly enhance life safety, and may allow the Fire Department to arrive at a fire scene of lesser consequence.

Should any questions arise regarding this matter, please feel free to contact me at (213) 267-2467.

By
JERRY PECKETT
CAPTAIN
FIRE PROTECTION ENGINEERING
PREVENTION & CONSERVATION BUREAU

NO RESPONSE REQUIRED

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION NINE
211 Main Street, Room 1100
San Francisco, California 94105

January 10, 1985
IN REPLY REFER TO
HPP-09

U. S. Army Corps of Engineers
Los Angeles District
P. O. Box 2711
Los Angeles, California 90053-2325
Attention: SPLPD-RA

Gentlemen:

We have reviewed the draft supplement to the final environmental impact statement for the U.S. Corps of Engineers' Flood Control Project on the South Fork of the Santa Clara River in Los Angeles County, California and provide the following comments:

1 1. Except for the third paragraph on page 7, the project report does not provide any information on how this project will affect transportation.

2 2. This project plans to utilize the existing culverts under I-5, under Wiley Canyon Road just west of I-5 and under Old Road west of I-5. There was no indication of their design capacity and if they are adequate for the increased flow resulting from this project, other than the standard project overflow map (plate 5). Paragraph 3 conflicts with this map. 3

We appreciate this opportunity to comment on the subject draft supplemental EIS and would like to receive a copy of the final EIS when it becomes available.

Sincerely yours,

Willis Kisselburg Jr.
Willis Kisselburg, Jr.
Director, Office of Planning and
Program Development

Response to January 10, 1985 letter from Willis Kisselburg, Jr., U.S. Department of Transportation, Federal Highway Administration

1 Please see page EA-35, section 5.28 of the Environmental Assessment for a description of project impacts on traffic.

2 Please see page 2, part III., sections 3.01 and 3.02, of Appendix D. Existing South Fork Channel from stations 97 + 68.98 to 91 + 77.35, including the culvert section under the Old Road, are adquately designed to carry the SPF flow of 6,000 cfs. The adequacy of channel sections near IH-5 is described in the second paragraph of section 3.02.

3 Plate 5 has been modified to reflect the adequacy of the channel and culverts.

APPENDIX B

HYDROLOGY

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Purpose and Scope

1. This section presents hydrology in support of the Detailed Project Report on the South Fork of the Santa Clara River, Santa Clarita Valley, California. Plate B-1 shows drainage area boundaries. The section has three major objectives: (a) to outline the basic meteorologic and hydrologic characteristics of the study area; (b) to present the methods and techniques used to model the runoff process and to develop discharge frequency relationships; (c) to provide standard project flood (SPF) peak discharge values and discharge frequency curves for present and future conditions of basin development at selected concentration points along South Fork both with and without the proposed project, and (d) to provide the probable maximum flood hydrograph and debris storage requirement for the Towsley-Wiley debris basin site. Throughout this section the phrase "present conditions" refers to basin development in project year 1 (1982); likewise, the phrase "future conditions" pertains to project year 10 (1992) and beyond. SPF peak discharges are given in table B-1 and on plate B-2. Basin characteristics are given in table B-2.

Prior Hydrology

2. Hydrology for the total Santa Clara River Basin was first presented in the District Engineer's report entitled "Report on Survey of the Santa Clara River, California, for Flood Control," dated December 20, 1945. Hydrology for the whole river basin also was presented in the reports, "Design Memorandum No. 1, Hydrology for the Santa Clara River Levee," dated October 1958 and approved January 7, 1959, and "Review Report for Flood Control, Santa Clara River and Tributaries, Los Angeles County," May 24, 1966. An additional report pertaining to a portion of the Santa Clara River Basin is entitled "Interim Review Report for Flood Control, Newhall, Saugus, and Vicinity, Los Angeles County, Santa Clara River and Tributaries, California," dated December 15, 1971 (hereafter referred to as the 1971 interim report). The basic data and method of determining floods used in the current report is approximately the same as was used in the 1971 interim report, with the exception of land-use projections.

Prior Approval

3. The standard project and probable maximum flood estimates and estimates of debris quantities for the entire Santa Clara River Basin were orginally approved, with comment, by the Office of the Chief of Engineers in the second indorsement, dated July 14, 1966, to the basic letter dated May 24, 1966, subject: "Review Report for Flood Control, Santa Clara River and Tributaries, Los Angeles County." Subsequent revisions were included in the 1971 interim report and approved. The regional frequency analysis was approved for use in the 1971 interim report in the first indorsement dated January 14, 1971, to the basic letter dated September 15, 1970.

Proposed Plan of Improvement

4. The proposed plan of improvement consists of (a) a debris basin at the junction of Towsley and Wiley Canyon; (b) a rectangular concrete channel from the debris basin to Lyons Avenue; (c) new bridges at Atwood Boulevard, DeWolfe Road and Wiley Canyon Road; and (d) slight modification to provide freeboard on existing channel downstream of Lyons Ave.

GENERAL DESCRIPTION OF THE DRAINAGE AREA

Physiography and Topography

5. Rising in the Santa Susana and San Gabriel Mountains, the South Fork of the Santa Clara River flows generally northward through the Santa Clarita Valley, joining with the Santa Clara River downstream from Bouquet Canyon. Elongated in a east-west orientation, the 44-square-mile basin has a maximum width of about 12 miles and a maximum length of approximately 5 miles. The Santa Susana Mountains, which comprise the western and southwestern watershed boundaries, are characterized by long rock ledges and precipitous escarpments. The portion of the San Gabriel Mountains that forms the eastern and southeastern border of the basin is high and rugged but has comparatively uniform slopes. The maximum elevation in the watershed, on the southeast boundary, is about 4000 feet above sea level.

6. About 85 percent of the drainage area is mountainous terrain, with steep ridges and numerous canyons. Streambed gradients in the steeper reaches are on the order of 475 feet per mile. (Plate B-3 shows streambed profiles.) The remaining 15 percent of the watershed, which includes the communities of Valencia, Saugus, and Newhall, is comprised of rather narrow alluvial valleys. Here, streambed slopes range from 60 to 160 feet per mile. The reach in which improvements are being considered has a slope of 83 feet per mile.

Geology and Soils

7. The Santa Susana Mountains are composed of highly-folded, sedimentary formations consisting of sandstone, siltstone, mudstone, and conglomerate. The formations have been folded and faulted spectacularly, producing many complex geologic structures. The soft, friable rocks most commonly found are easily weathered. Most soils are shallow loamy sands that are moderately permeable.

8. The San Gabriel Mountains are composed of igneous granites and anorthosites along with metamorphic gneiss and schist. Soils in the San Gabriels are mainly coarse sandy or gravelly loams.

9. Alluvial deposits of poorly sorted gravel, sand, and silt cover the floor of the valley in the lower reaches of the South Fork to a maximum depth of several hundred feet. The valley fill forms pervious deposits that serve as underground reservoirs for water storage.

10. The area is seismically active, and several major faults cross the drainage basin.

Land Use

11. Future land-use projections for the study area were developed from California Department of Finance D-100 population figures, Southern California Association of Governments (SCAG) land-use allocations, and general plans developed by local agencies of the Newhall, Saugus, Valencia area. Local plans indicate desired growth patterns and ultimate growth goals. Future urbanization is shown on plate B-4.

12. The currently projected population figures, hence the amount of development, are substantially less than those used in the 1971 interim report. For example, the 1971 report anticipated a 1990 population in the Newhall area of 225,000 whereas a 1990 population of 130,000 is projected now. But because of the relatively small portion of the total basin that will be developed and the location of the project development, the reduction in peak discharge from the 1971 interim report values is small.

Runoff Characteristics

13. Streamflow is small except during and immediately after rainfall because climatic and basin characteristics are not conducive to significant continuous flow. Runoff increases rapidly in response to rainfall excess. Baseflow and percolation are considered negligible. Snowmelt is not a significant contributing factor to runoff in this basin. Some summer flow results from springs in the upper reaches.

Climatology

14. The climate of the South Fork basin is generally mild and subtropical, with warm, dry summers and cool, wet winters. Daily maximum temperatures in the valley areas near Newhall normally range from around 60 degrees F in winter, to about 90 degrees F in summer, with somewhat cooler readings over the surrounding mountains. Normal daily minima in all areas of the basin run generally in the 30 to 35-degree range in winter and from 50 to 60 degrees in summer. Extremes in temperature in the study area run from approximately 10 degrees F in certain valleys and canyons to around 115 degrees F over the lower valley floor. Average winds in the region are generally quite light, but strong north to northeast winds develop at times during the cooler months, with occasional gusts to more than 60 miles per hour.

15. Mean annual precipitation ranges from less than 18 inches in northern Saugus to more than 25 inches over the Santa Susana and western San Gabriel Mountains. Isohyets of mean seasonal precipitation are shown on plate B-5. Most precipitation in the region occurs between mid-November and early April and rainless periods of several months are common during the summer. Snow occurs at times over the higher elevations of the region and on rare occasions over the entire study area.

16. There are three basic types of storms that can produce precipitation in the basin; general winter storms, general summer storms, and local storms.

a. General winter storms usually occur from mid-November through early April. They originate over the Pacific Ocean as a result of interaction between polar Pacific and tropical Pacific air masses and move eastward across California. Sometimes lasting several days, general winter storms reflect orographic influences and usually are accompanied by widespread light to moderate precipitation.

b. General summer storms are infrequent in southern California, and those that do occur usually are associated with late summer or early fall cyclones. To date, no major floods are known to have resulted from such storms in the study area.

c. Local storms can occur at any time of the year, either during general storms or as isolated phenomena. These storms, which frequently are accompanied by lightning and thunder, cover comparatively small areas but result in high-intensity precipitation for a few minutes to several hours.

PRECIPITATION AND RUNOFF

Precipitation Records

17. Precipitation records of 10 or more years are available for several stations in the vicinity of the South Fork watershed. The map of mean seasonal isohyets appearing on plate B-5 is taken from the 80-year (1872-1952) mean isohyetal map prepared by the Los Angeles County Flood Control District, and its values are very similar to mean values in the region since 1952. Stations in the vicinity are given in table B-3.

Streamflow Records

18. Streamflow records are available for one station in the basin: the South Fork-Santa Clara River at Magic Mountain Parkway. Annual peak flows for this station are tabulated in table B-4. The location of the station is shown on plate B-1.

SYNTHESIS OF STANDARD PROJECT FLOOD

General

19. The standard project flood represents the flood that would result from the most severe combination of meteorologic and hydrologic conditions considered reasonably characteristic of the region. It normally is larger than any past recorded flood in the area, and can be expected to be exceeded in magnitude only rarely.

Standard Project Storm

20. The 3-hour local storm of March 3-4, 1943 (pl. B-6), transposed and centered over the area tributary to the selected concentration points, was found to be the storm that represents the most severe flood-producing factors that may reasonably be expected to occur in the general area. It was, therefore, selected as the standard project storm and was used to determine the standard project flood in the 1971 interim report. A typical hyetograph is shown on plate B-7.

21. As a check, the unaltered rainfall amounts and intensity patterns given in the report "Generalized Standard Project Rainflood Criteria for Southern California Coastal Streams," dated March 1967 and prepared by the Hydrologic Engineering Center, were applied, and similar results were obtained.

Precipitation-Runoff Relationships

22. Available precipitation and runoff records are inadequate for a complete analysis of precipitation-runoff relationships in the South Fork basin. Rainfall-runoff relationships adopted for this study were based on previous hydrologic investigations made on streams in southern California. Elements used to establish rainfall-runoff relationships are discussed in the following paragraphs.

23. The Los Angeles District unit hydrograph procedure is described in the Department of the Army Technical Bulletin No. 5-550-3 entitled "Flood Prediction Techniques," dated February 1957. Synthetic unit hydrographs for the various subareas were developed through the use of the lag relationship depicted on plate B-8 and its application to the Santa Clara River S-graph (pl. B-9). Subarea basin n values used in the lag relationship were determined by field inspections and comparison with n values derived from reconstitutions of observed flood events in similar basins in southern California. The Santa Clara S-graph shown on plate B-9 is an average of S-graphs determined on the Santa Clara River near Saugus and four S-graphs in the Santa Margarita River Basin. (The Santa Margarita Basin was found to have similar runoff characteristics.) For urbanized subareas, the basin n value was reduced in proportion to the degree of urbanization. This adjusts the lag time to account for the more rapid response of an urban watershed to rainfall excess. Table B-2 presents pertinent drainage basin characteristics for both present and future conditions.

24. Precipitation loss rates were based on field reconnaissance and loss rates from other basins with similar geomorphological characteristics in the Los Angeles area. A constant loss rate of 0.35 inch per hour, reduced in proportion to the percent impervious cover, was considered applicable for use in computing the standard project flood.

Flood Routing

25. Flood routing through both natural and improved channels was performed using the Muskingum Method. Flood wave travel time in a reach, which approximates the Muskingum coefficient K, was determined by dividing reach length by average peak flow velocity. Manning's formula for normal depth and an appropriate cross section were used to compute the average peak flow velocity for the reach. Cross sections were determined from USGS topographic maps, field investigations, as-built drawings, and proposed channel improvements. Muskingum X values were estimated according to the relative importance of channel storage. Values of X used in this study were estimated to range from 0.1 for reaches with limited channel capacity and wide cross sections and large amounts of channel storage to 0.3 for reaches with well-defined channels. Routing coefficients are given in table B-5.

Computation of the Standard Project Flood

26. Standard project floods were computed by centering the standard project storm upstream from a concentration point in the most critical flood-producing manner. Application of the rainfall loss rate function described previously to standard project precipitation enables the determination of rainfall excess. The rainfall excess is then applied to the subarea unit hydrograph to produce the subarea flood hydrograph. Base flow was considered negligible; thus combining and routing of subarea flood hydrographs to the desired concentration point completes the computation.

27. Standard project flood peak discharges, computed as described in the foregoing paragraphs, are presented in table B-1 and on plate B-2 for two conditions: (a) present conditions, without project, (b) future conditions, with project, including improvements to Newhall and Placerita Creeks. A typical standard project flood hydrograph is shown on plate B-7.

SYNTHESIS OF PROBABLE MAXIMUM FLOOD

General

28. The probable maximum flood (PMF) is defined as the flood that would result if the probable maximum precipitation for the drainage area were to occur at a time when ground conditions were conducive to maximum runoff. PMF, as its name implies, is an estimate of the upper bound of flood potential on a watershed, and is required in designing the spillway for the proposed Towsley-Wiley Canyon debris basin.

Probable Maximum Precipitation

29. Estimates of probable maximum precipitation (PMP) given by the Hydrometeorological Branch of the National Weather Service in Hydrometeorological Report No. 49, "Probable Maximum Precipitation Estimates, Colorado River and Great Basin Drainages" dated September

1977, indicate that the highest rate of discharge from the study area would result from a 6-hour convective type storm (thunderstorm). The average depth of precipitation for various durations during the probable maximum storm for the watershed upstream of the proposed debris basin was determine to be 5.06, 7.57, 10.76, and 12.94 inches for the maximum 1/2-, 1-, 3-, and 6-hour periods, respectively. These values were determined by adjusting the 1 hour-1 square mile maximum precipitation for the drainage basin by the appropriate duration variation ratios and the depth-area-duration coefficients. A time interval of 15 minutes was selected as the shortest period for which precipitation intensities would be required to define the flood hydrograph. The intensities determined from a depth-duration curve were based on average PMP over the basin.

Computation of the Probable Maximum Flood

30. Computation of PMF was accomplished in the same manner as SPF, with two exceptions. First, the basin lag time was reduced by 15 percent to reflect the enhanced hydraulic efficiency of a watershed experiencing high depths of flow. Secondly, a constant loss rate equal to 0.15 inches per hour was considered applicable for ground conditions conducive to maximum runoff. A probable maximum flood peak discharge of 24,500 cfs was computed at the proposed debris basin. The corresponding flood hydrograph and precipitation intensity pattern is shown on plate B-10.

DEBRIS STORAGE REQUIREMENTS

General

31. The proposed improvements on the South Fork-Santa Clara River include a debris basin immediately downstream of the confluence of Towsley and Wiley Canyons. The storage provided is sufficient to accommodate the debris from a single major flood.

Determination of Debris Storage Requirements

32. The storage required for debris was determined using the procedure outlined in "A New Method of Estimating Debris Storage Requirements for Debris Basins" by F. E. Tatum. Debris production estimates using this method are based on drainage basin size, slope, drainage density, hypsometric-analysis index, 3-hour rainfall from a major storm event, and burn effect. The following correction factors were used: slope, 0.55; drainage density, 0.90; hypsometric index, 0.85; and 3-hour rainfall, 0.82. The geological factors observed during field inspection of the watershed indicate a moderate potential for debris production. Typical streambed profiles upstream of the considered debris basin are shown on plate B-4.

Debris Storage Estimate

33. Based on the aforementioned method of determining debris production, the estimated debris storage requirement for the proposed Towsley-Wiley Canyon debris basin is 350,000 cubic yards.

ADEQUACY OF DESIGN ESTIMATES

Standard Project Flood

34. The standard project flood as developed is of a magnitude that would be exceeded only rarely. Because of the lack of long-term streamflow records, the adequacy of SPF estimates is best determined from a comparison with the enveloping curve of estimated and recorded peak discharges for coastal southern California basins shown on plate B-11. The plotted SPF values are only slightly lower than would commonly be expected, because higher than normal loss rates were used.

Probable Maximum Flood

35. The adequacy of the probable maximum flood estimate for the considered debris basin is best indicated by the severity of the various hydrologic factors (storm magnitude, precipitation-intensity pattern, and loss rate) on which the estimate is based. The occurrence of any of these factors in the severity assumed would be infrequent, and a flood resulting from the combination of all these conditions would be very severe. An indication of the adequacy of the PMF peak discharge is shown by the relatively high plotting position on the enveloping curve of peak discharges shown on plate B-11.

Debris Storage Requirement

36. The adequacy of the debris storage requirement is difficult to determine by comparison with recorded debris production in the area because of the insufficient data. The adequacy of the debris storage estimate is indicated by comparison with the enveloping curves of debris inflows shown on plate B-12.

DISCHARGE FREQUENCY ANALYSIS

General

37. Discharge frequency relationships for the South Fork were originally derived from the regional analysis presented in the 1971 interim report. These relationships were verified using the updated Santa Clara River-South Fork at Magic Mountain Parkway stream gage record. The following is a brief discussion of the approach used to derive the discharge frequency curve from the station record.

38. Although 30 years of peak flows (1948-77) have been recorded at the South Fork gage, peak flows for 4 years (1948-51) are small. (See table B-5.) Those 4 years of peak flows are considered to unreasonably bias

the record statistics. Therefore, the record was truncated, eliminating those 4 years, and the incomplete record adjustment was made according to procedures described in Water Resources Council Guidelines Bulletin 17B. The statistics for the incomplete record curve are shown in table B-5. The regional skew of -0.4 was based on a weighted average, by years of record, of 11 streamgages in the region. The statistics of the station records are listed in table B-6. As shown on plate B-13, the curve derived from the synthetic statistics of the gage record is similiar to the curve derived from the regional analysis. Hence, the original curve derived from the regional analysis is still considered appropriate for use on the South Fork.

39. Future condition discharge frequency curves were determined by generating the series of floods resulting from 100, 80, 50, and 20 percent of standard project rainfall at each frequency curve location point under both present and future conditions. Future condition values were computed by adjusting present condition unit hydrograph and loss rate parameters to reflect future development. The exceedence frequencies of the values of peak runoff under present conditions for the four ratios of standard project rainfall were noted on the predetermined present condition frequency curves. The peak values of runoff under future conditions for the four ratios of standard project rainfall were then plotted at the corresponding exceedence frequencies. The resulting frequency curve for the future condition, therefore, reflects the change in watershed response caused by urbanization. In the project area, the small percent increases in the SPF peak discharges continues to reflect a nonsynchronization of subarea hydrograph peaks.

Discharge Frequency Values

40. Discharge-frequency curves for present conditions at locations "South Fork downstream of Lyon Canyon Confluence" and "South Fork at Magic Mountain Parkway" (gaging station) were derived using the regional frequency analysis. The recurrence interval of their respective SPF peak discharges was found to be approximately 500 years. These curves are shown on plates B-13 and B-14. Discharge frequency values for other points of interest on the South Fork were obtained from curves drawn parallel to one of these two curves, adjusted by computed SPF peak discharges. For the reach from the mouth of the South Fork to the Newhall Creek confluence, frequency derived for the gaging station are applicable. From the Newhall Creek confluence to Orchard Village Road, curves drawn parallel to the above-mentioned gaging station curve, adjusted by the computed SPF peak discharges, are appropriate. From Orchard Village Road to the Lyon Canyon confluence, the frequency curve "South Fork downstream of Lyon Canyon confluence" applies. For the reach upstream of the Lyon Canyon confluence, the frequency curve was drawn parallel to the "South Fork downstream of Lyon Canyon Confluence" curves, adjusted by the computed SPF peak discharges.

Table B-1. SPF Peak Discharges

CP	Location	Drainage Area (sq. mi.)	Present Conditions Without Project (cfs)	Future Conditions With Project (cfs)
	South Fork			
100	at Towsley-Wiley Debris Basin site	5.66	6,000	6,000
101	at I-5	10.4	11,000	11,000
102	below unnamed tributory	10.9	11,000	12,000
103	below Lyon Canyon	12.7	12,000	13,000
106	above Pico Canyon	15.6	12,000	13,000
110A	above Newhall Creek	23.4	16,000	20,000
110B	below Newhall Creek	41.0	20,000	25,000*
112	above Santa Clara River	44.9	20,000	25,000*
	Gavin Canyon			
100A	above Towsley-Wiley Canyon	4.7	5,800	5,800

* include improvements to Newhall and Placerita Creeks

Table B-2. Subarea Characteristics

Sub-area	Drainage area (sq mi)	Length (mi)	Lca (mi)	Slope (ft/mi)	"n" Value Present	"n" Value Future	Impervious Cover (%) Present	Impervious Cover (%) Future
1	4.7	4.2	1.7	450	0.045	0.045	3	3
2	5.7	4.5	2.6	480	0.045	0.045	0	2
3	2.3	3.2	0.9	445	0.045	0.035	5	15
4	1.3	2.3	0.6	165	0.025	0.020	30	40
5	7.0	7.7	3.8	297	0.040	0.037	10	15
6	1.6	3.1	1.6	250	0.025	0.020	20	30
7	0.8	2.1	1.0	169	0.020	0.017	40	50
8	7.6	4.3	1.7	477	0.045	0.040	5	15
9	0.4	1.5	1.1	60	0.020	0.017	40	50
10	9.6	8.1	4.2	295	0.040	0.040	10	20
11	1.4	3.4	2.1	96	0.025	0.015	15	40
12	2.5	4.4	2.1	100	0.035	0.030	5	30

Table B-3. Precipitation Stations.

LACFCD NO.	Station	Elevation (ft)	Latitude Deg.	Latitude Min.	Longitude Deg.	Longitude Min.
32 C-E	Newhall-Soledad Div. Hd. Qtrs.	1243	34	23	118	32
200	Saugus-So. Cal. Ed. Co. Substation	1096	34	2J	118	34
284-D	Placerita Canyon	1485	34	23	118	29
363C	Wilson Canyon	3175	34	21	118	27
475	Saugus-Newhall Land and Farming Co.	1150	34	25	118	33
493D	San Canyon-McMillen	1805	34	23	118	25
1040	Potrero Canyon-Sunray Dx Oil Co.	1150	34	24	118	38
1142	Soledad Canyon-Bermite Powder Co.	1200	34	25	118	31
6602	Pacoima Dam	1500	34	20	118	24
7762	San Fernando Ph No. 3	1250	34	19	118	30

Table B-4. Analytical Frequency Analysis of Annual Peak Flows, South Fork-Santa Clara River at Magic Mountain Parkway

Gaged Data			Ordered Data		
Water Year	Peak Discharge (cfs)	Rank	Water Year	Peak Discharge (cfs)	Median Plotting Position
1948	82	1	1969	7570	0.023
1949	37	2	1952	6800	0.055
1950	71	3	1971	6260	0.088
1951	6	4	1966	5630	0.121
1952	6800	5	1973	4520	0.154
1953	1050	6	1958	3640	0.187
1954	1100	7	1962	3410	0.220
1955	460	8	1959	2410	0.253
1956	573	9	1957	2030	0.286
1957	2030	10	1967	1820	0.319
1958	3640	11	1963	1750	0.352
1959	2410	12	1977	1750	0.384
1960	120	13	1968	1650	0.417
1961	196	14	1972	1490	0.450
1962	3410	15	1975	1266	0.483
1963	1750	16	1974	1180	0.516
1964	870	17	1954	1100	0.549
1965	960	18	1953	1050	0.582
1966	5630	19	1965	60	0.615
1967	1822	20	1964	870	0.648
1968	1650	21	1970	838	0.680
1969	7570	22	1976	586	0.713
1970	838	23	1956	573	0.746
1971	6260	24	1955	460	0.779
1972	1490	25	1961	196	0.812
1973	4520	26	1960	120	0.845
1974	1180	27	1948	82	0.878
1975	1266	28	1950	71	0.911
1976	586	29	1949	37	0.944
1977	1750	30	1951	6	0.977

Statistics of truncated record N = 26
Logrithmic mean = 3.172
Standard deviation = 0.448
Computed skew = -0.48

(see para. 38)

Synthetic statistics per bulletin 17B
Logarithmic mean = 3.088
Standard deviation = 0.500
Generalized Skew = -0.4

Table B-5. Muskingum Routing Coefficients.

Channel Reach*	K coefficient (hrs)	Number of Sub-Reaches Without Project	With Project	X Coefficient Without Project	With Project
101 R 103	0.083	2	1	0.10	0.30
103 R 104	0.083	2	1	0.10	0.30
104 R 106	0.083	2	2	0.20	0.30
106 R 110	0.083	3	2	0.15	0.30
110 R 112	0.083	5	5	0.20	0.30

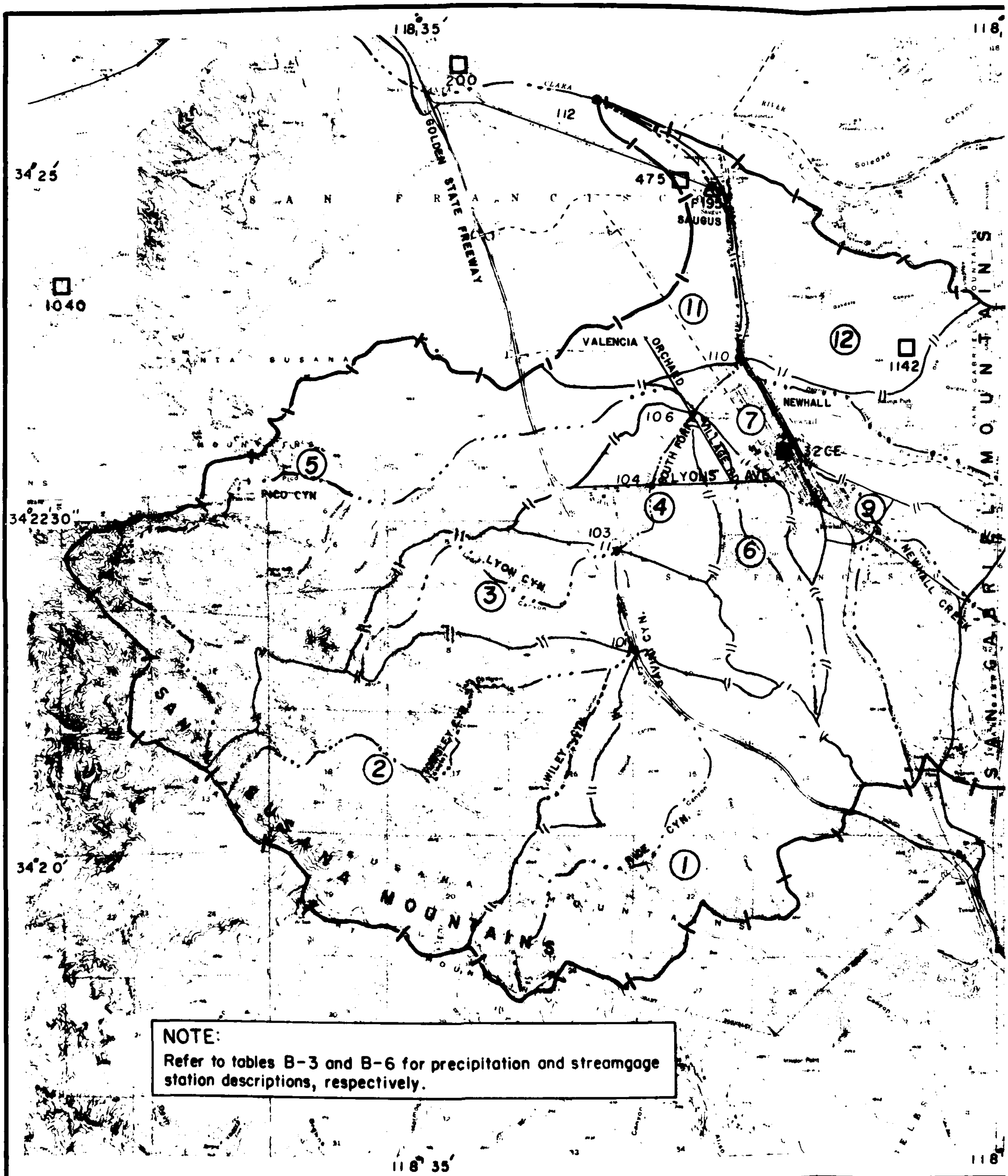
NOTE: See plate B-1 for locations of concentration points.

*The reach from concentration point 101 to concentration point 103 is symbolized by 101 R 103.

Table B-6. Gaging Stations Used in Regional Analysis.

Gaging Station	Drainage Area (sq mi)	Years of Record	Computed Statistics Mean	Std. Dev.	Skew
So. Fork-Santa Clara River at Magic Mtn. Parkway	40.9	29	3.028	0.607	-0.83
Santa Clara River above Lang Station	157	26	2.007	1.062	-0.19
Sisquoc River near Carey	471	33	3.247	0.863	-0.83
Cuyama River below Buckhorn Canyon near Santa Maria	884	49	2.771	0.900	-0.58
Santa Paula Creek near Santa Paula	40	51	3.051	0.622	0.22
Sespe Creek near Fillmore	251	62	3.745	0.623	-0.62
Sespe Creek near Wheeler Spring	49.5	29	2.802	0.768	-0.40
Hopper Creek near Piru	23.6	44	3.846	0.581	-0.42
Piru Creek near Piru	437	29	3.232	0.709	-0.35
Castaic Creek near Saugus	202	22	2.725	0.909	-0.65
Matilija Creek above Reservoir	50.7	21	2.778	0.914	-0.27

NOTE: Watersheds are unregulated.



NOTE:
Refer to tables B-3 and B-6 for precipitation and streamgage station descriptions, respectively.

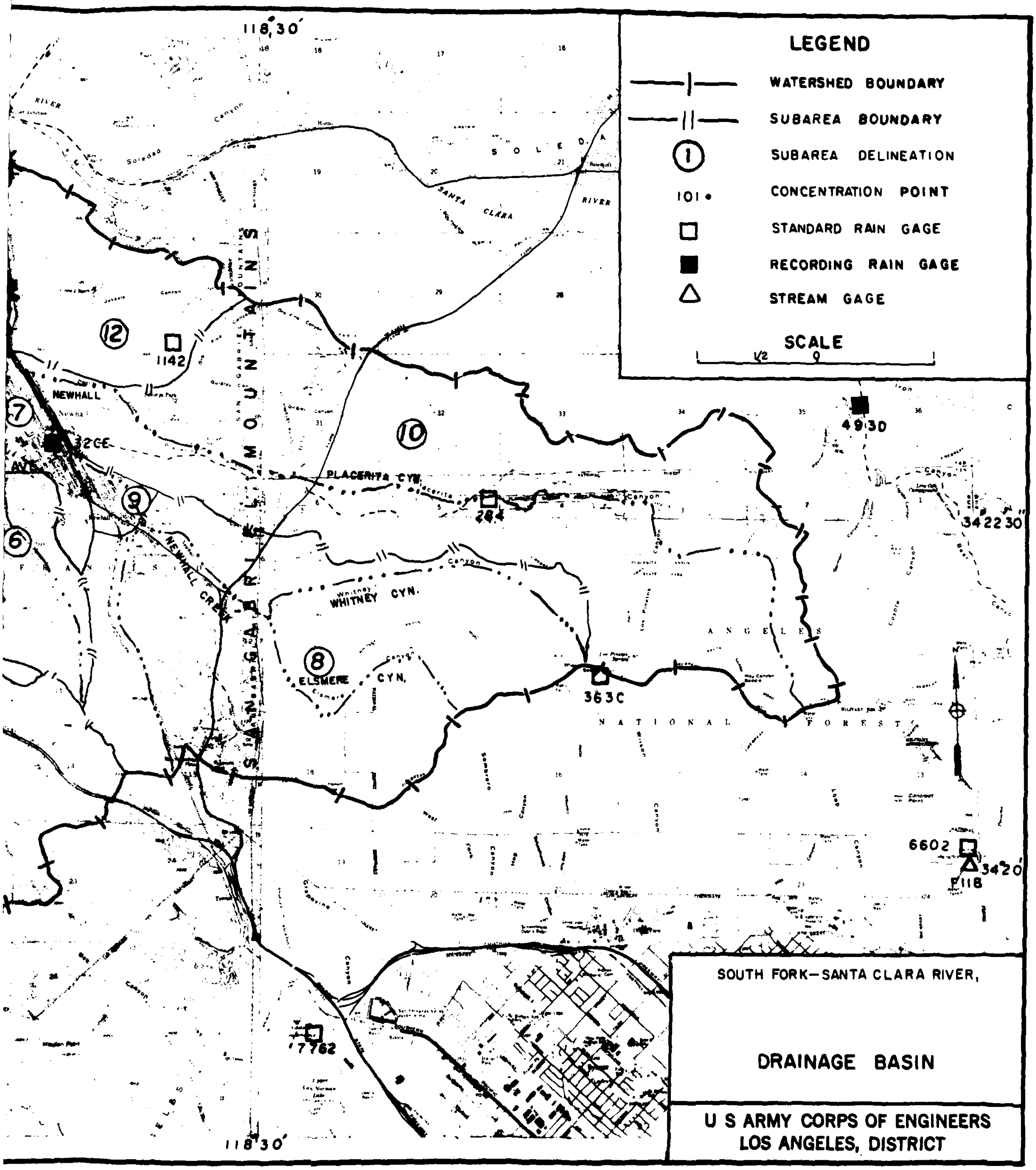
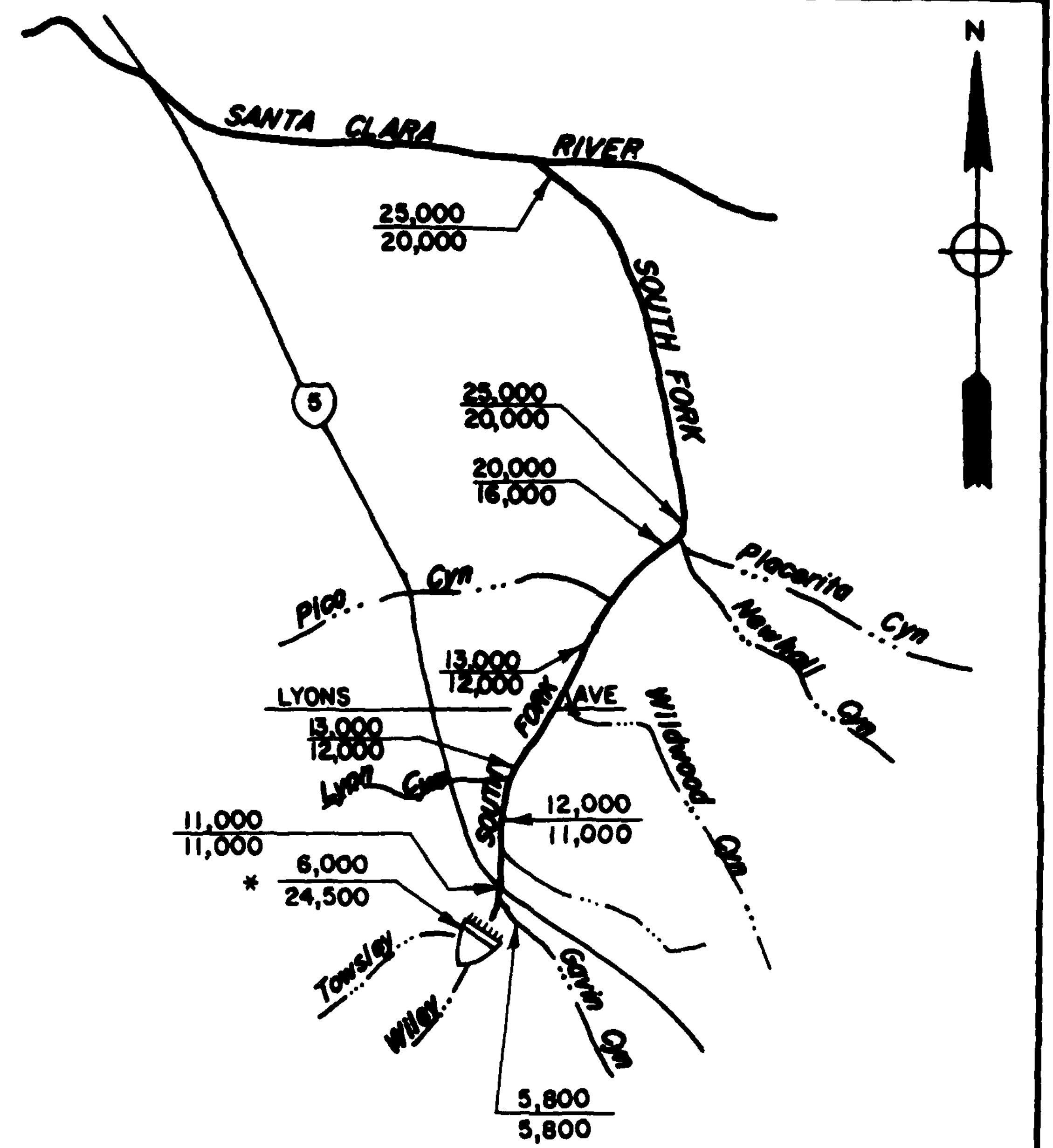

LEGEND
WATERSHED BOUNDARY
SUBAREA BOUNDARY
SUBAREA DELINEATION
CONCENTRATION POINT
STANDARD RAIN GAGE
RECORDING RAIN GAGE
STREAM GAGE
SCALE
118 30'
NEWHALL
PLACERITA CYN.
WHITNEY CYN.
ELSMERE CYN.
NEWHALL CREEK
SAN GABRIEL MOUNTAINS
SANTA CLARA RIVER
SOLEDAD
ANGELES NATIONAL FOREST
1142
3266
284
4930
342230
363C
6602
3420
F118
7762
SOUTH FORK—SANTA CLARA RIVER,
DRAINAGE BASIN
U S ARMY CORPS OF ENGINEERS
LOS ANGELES, DISTRICT

PLATE B-1



LEGEND

12,000 — STANDARD PROJECT FLOOD IN CFS, FUTURE CONDITIONS
11,000 — STANDARD PROJECT FLOOD IN CFS, PRESENT CONDITIONS

DEBRIS BASIN

* STANDARD PROJECT FLOOD PRESENT AND FUTURE COND.
PROBABLE MAXIMUM FLOOD

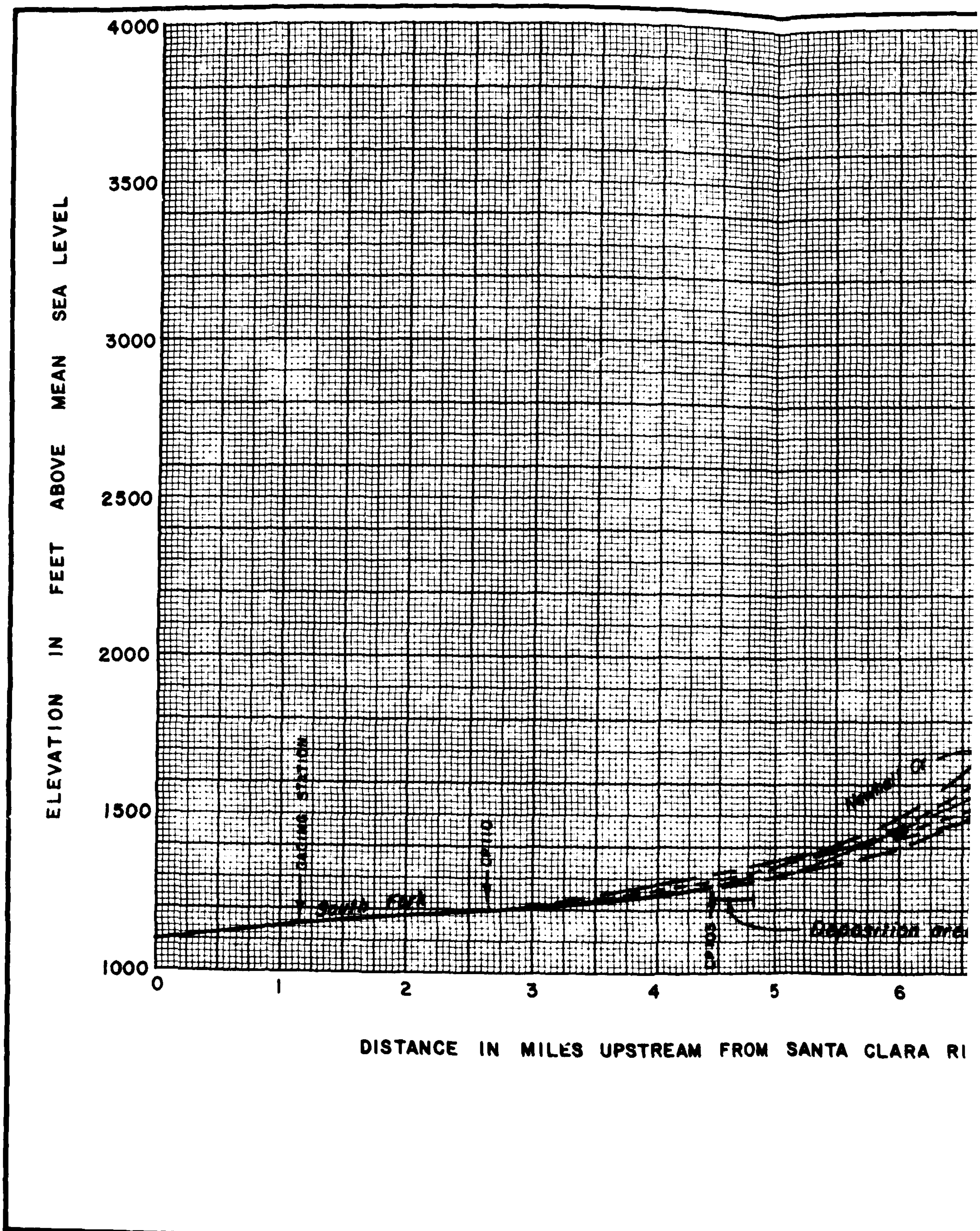
NOT TO SCALE

SOUTH FORK SANTA CLARA RIVER

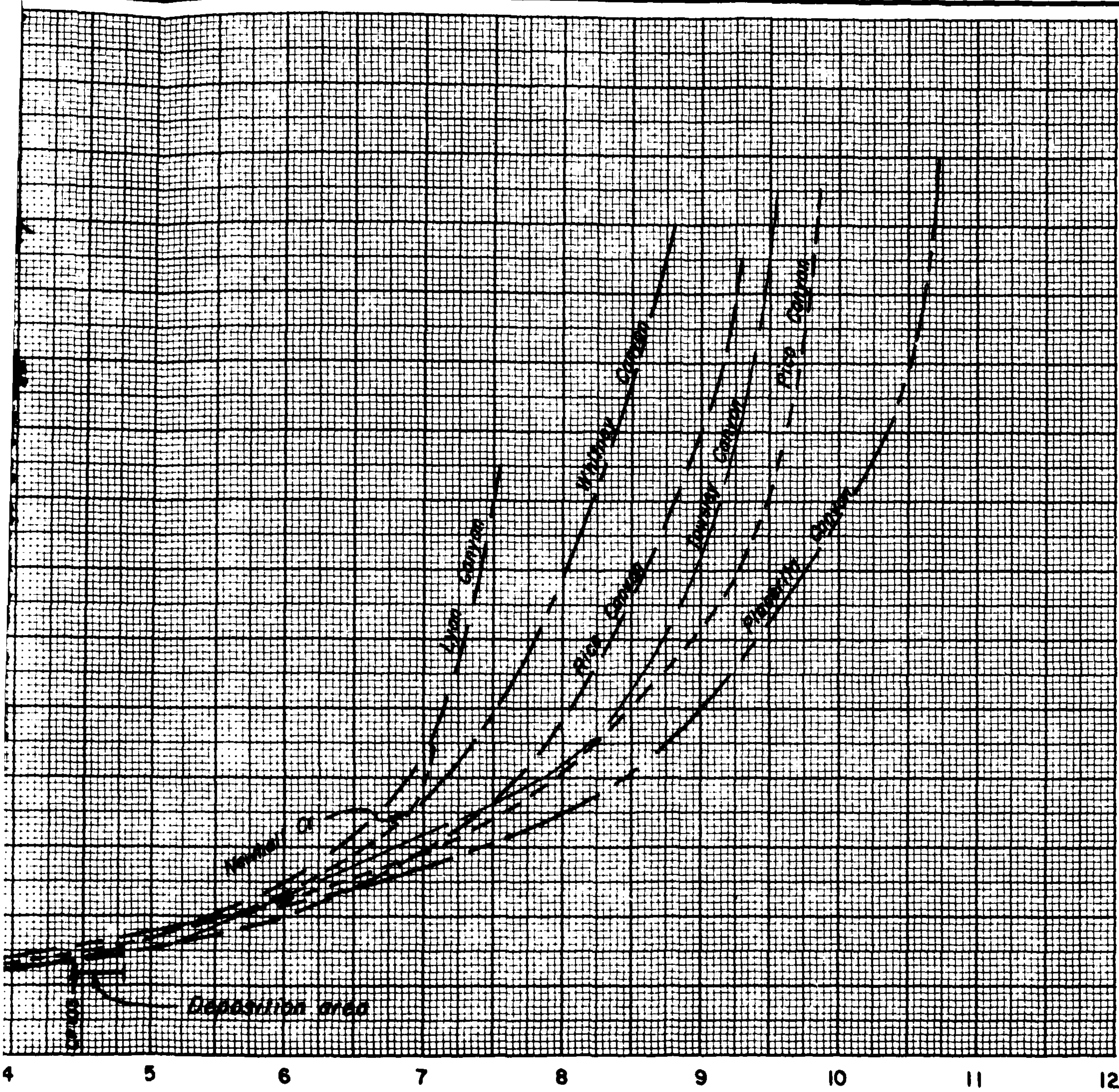
STANDARD PROJECT FLOOD PEAK DISCHARGES

U S ARMY CORPS OF ENGINEERS
LOS ANGELES, DISTRICT

PLATE B- 2



4000
3500
3000
2500
2000
1500
1000
ELEVATION IN FEET ABOVE MEAN SEA LEVEL
0
1
2
3
4
5
6
GAGING STATION
South Fork
CP110
CP103
Deposition area
DISTANCE IN MILES UPSTREAM FROM SANTA CLARA RI



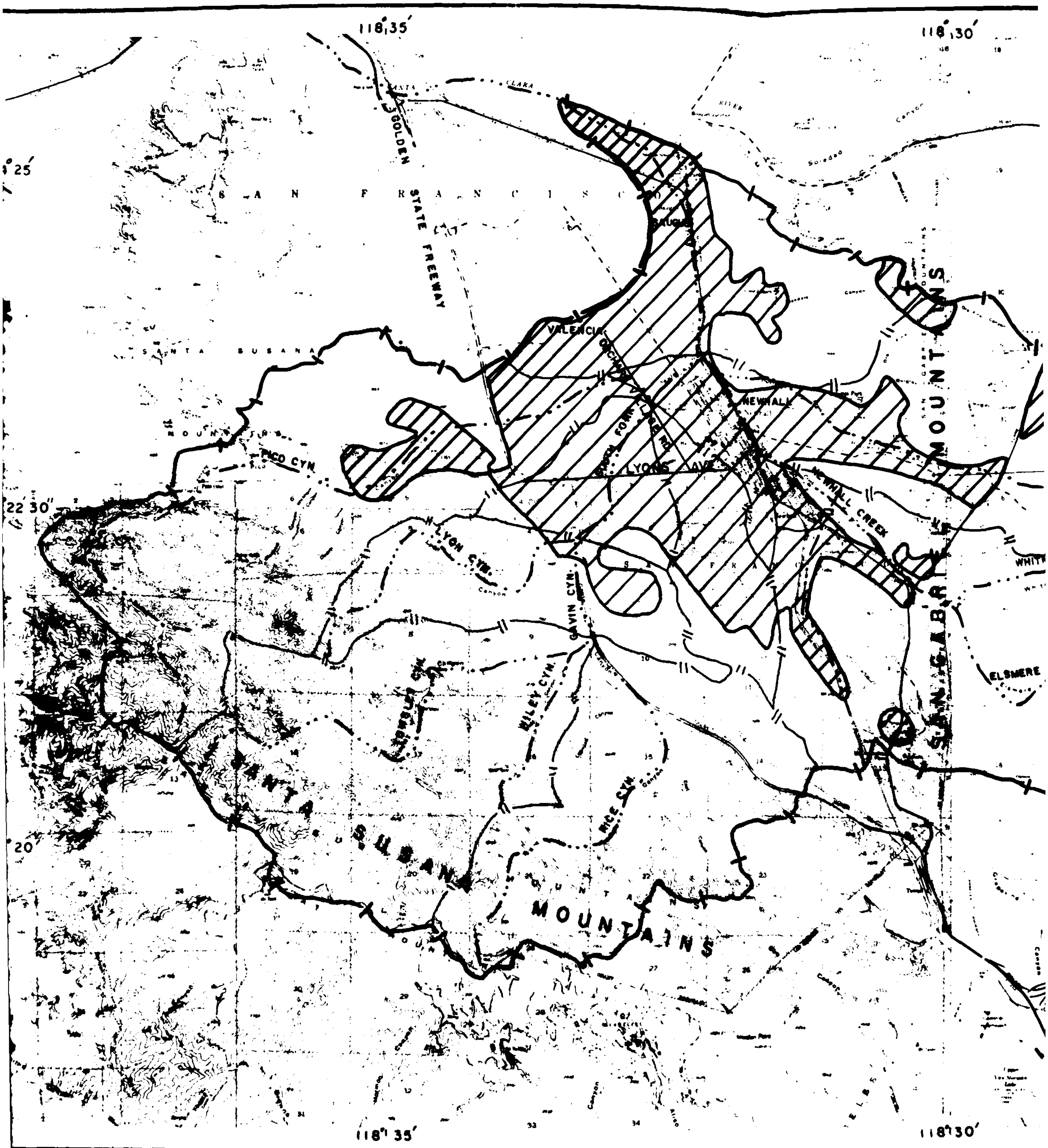
SOUTH FORK SANTA CLARA RIVER

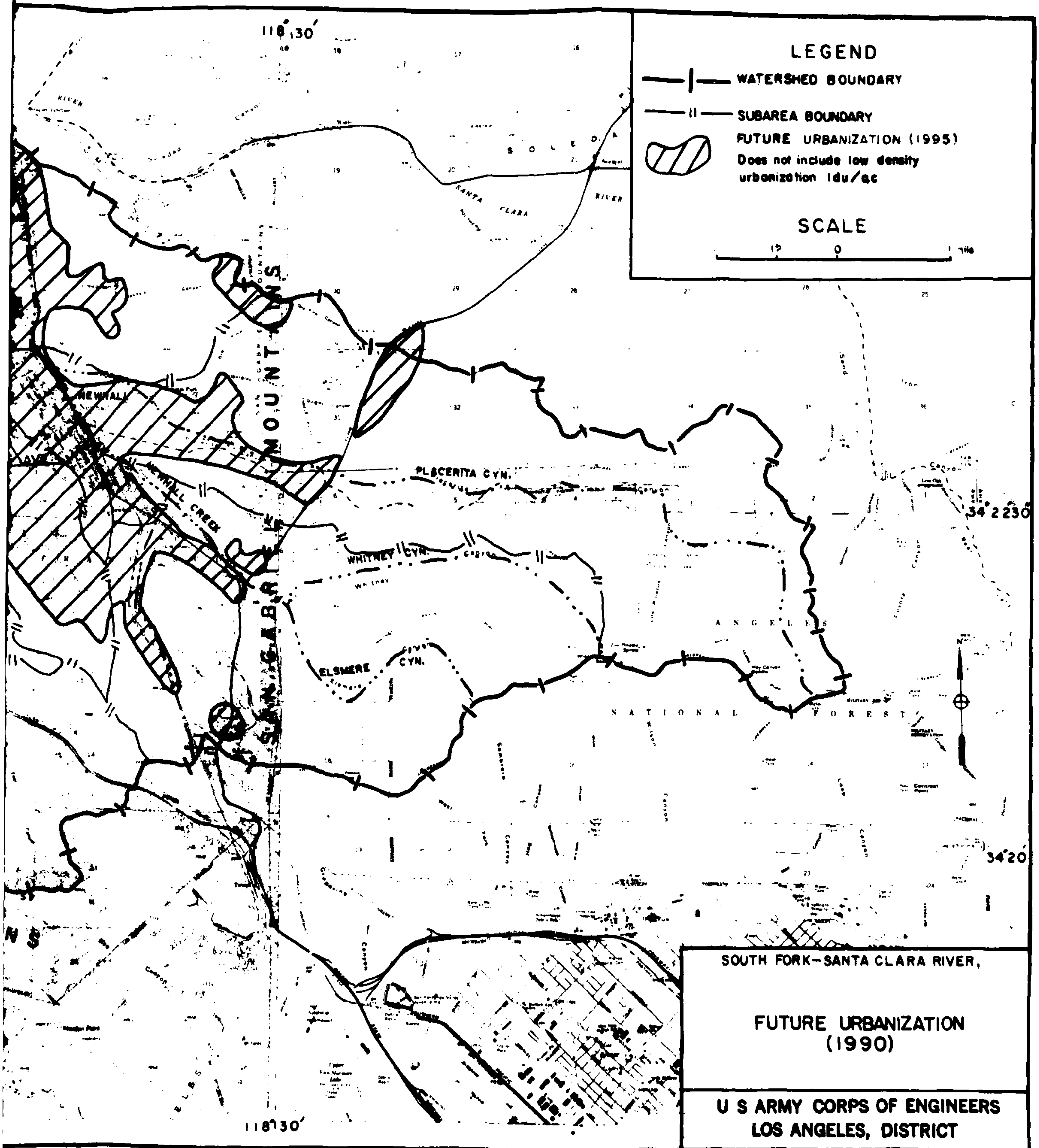
STREAMBED PROFILES

U S ARMY CORPS OF ENGINEERS
LOS ANGELES, DISTRICT

PLATE

2

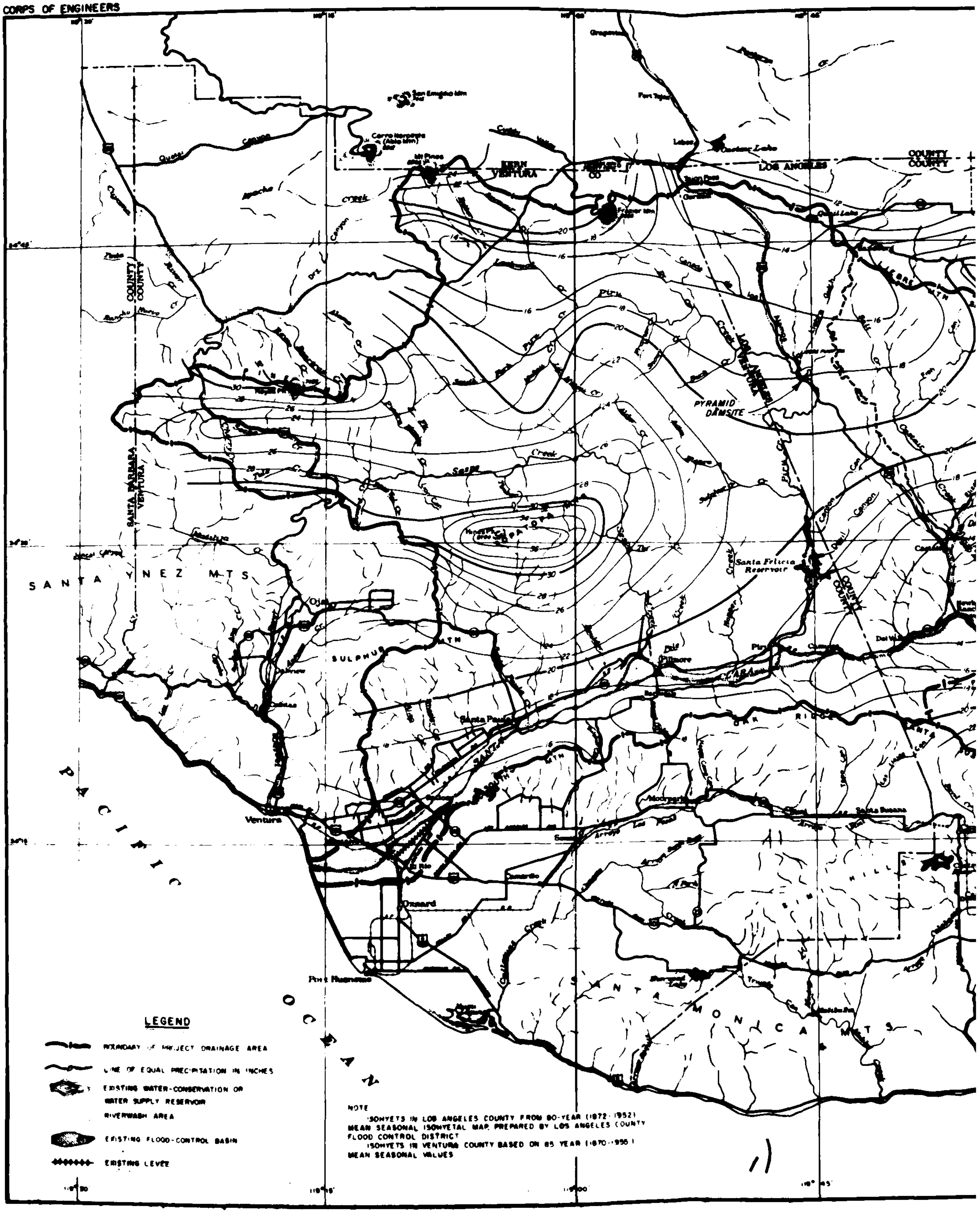

118°35′
118°30′
25′
22°30′
20′
SANTA CLARA RIVER
GOLDEN STATE FREEWAY
SAN FRANCISCO
SAUGUS
VALENCIA
SANTA SUSANA
PICO CYN.
NEWHALL
LYONS AVE.
NEWHALL CREEK
LYON CYN.
GAVIN CYN.
KILEY CYN.
RICE CYN.
SANTA SUSANA MOUNTAINS
SAN GABRIEL MOUNTAINS
ELSMERE
WHIT
118°35′
118°30′



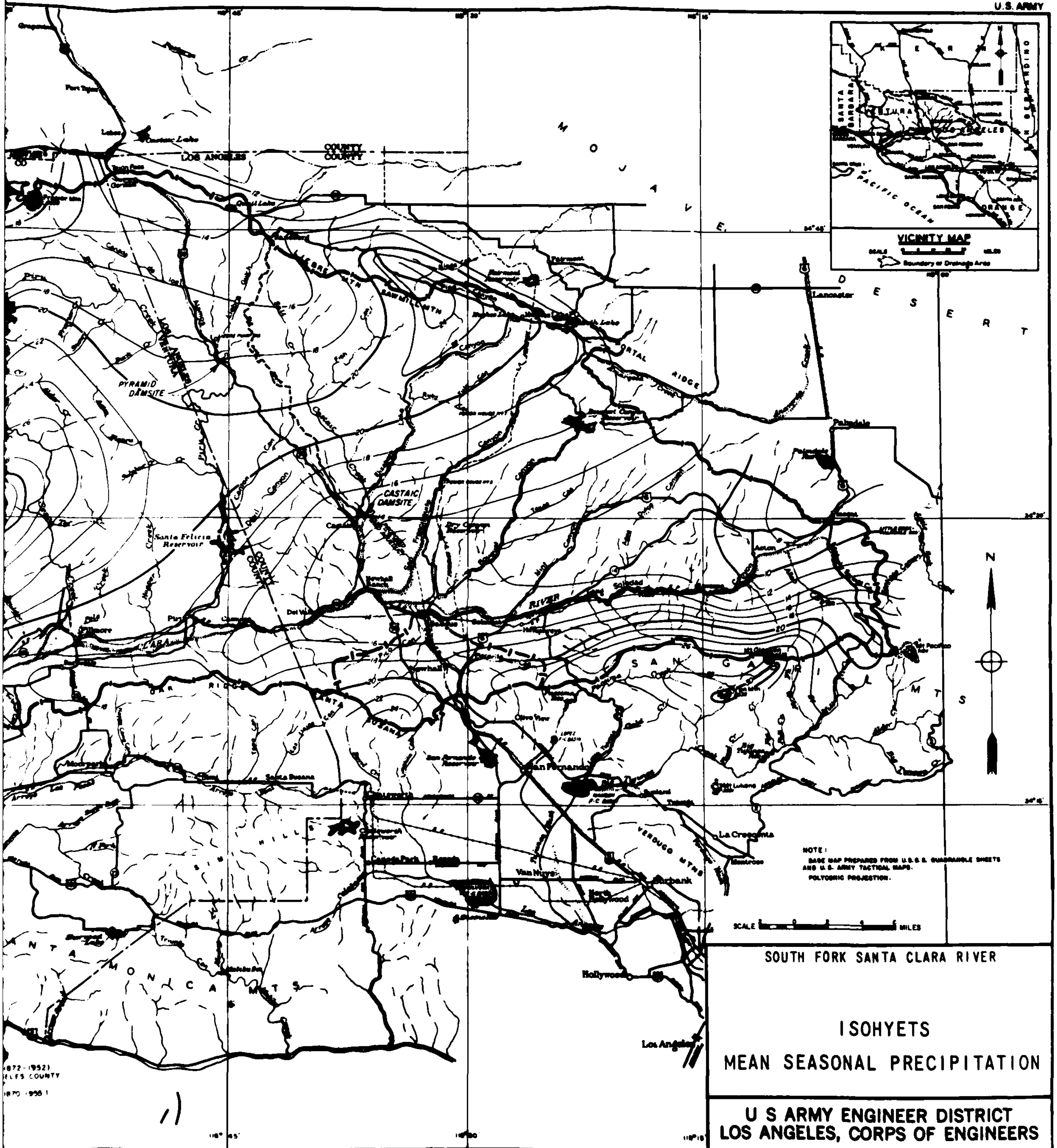
LEGEND
WATERSHED BOUNDARY
SUBAREA BOUNDARY
FUTURE URBANIZATION (1995)
Does not include low density urbanization 1du/ac
SCALE
0
1 mile
118°30'
34°22'30"
34°20'
118°30'
SANTA CLARA RIVER
NEWHALL
NEWHALL CREEK
PLACERITA CYN.
WHITNEY CYN.
ELSMERE CYN.
SAN GABRIEL MOUNTAINS
ANGELES NATIONAL FOREST
SOUTH FORK-SANTA CLARA RIVER,
FUTURE URBANIZATION (1990)
U S ARMY CORPS OF ENGINEERS
LOS ANGELES, DISTRICT

PLATE B-4

CORPS OF ENGINEERS



1)



SOUTH FORK SANTA CLARA RIVER

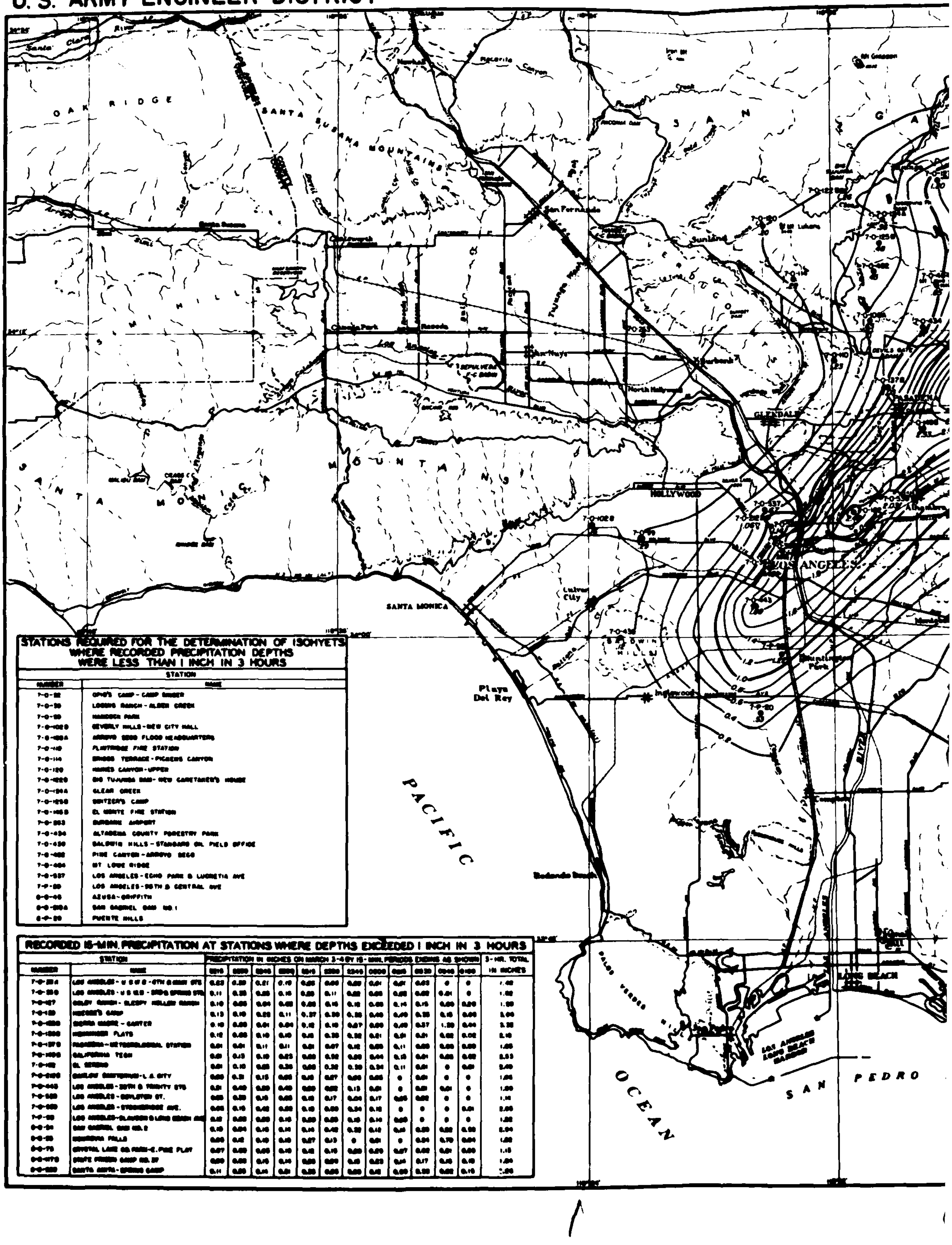
ISOHYETS

MEAN SEASONAL PRECIPITATION

U S ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

PLATE B-5

U. S. ARMY ENGINEER DISTRICT



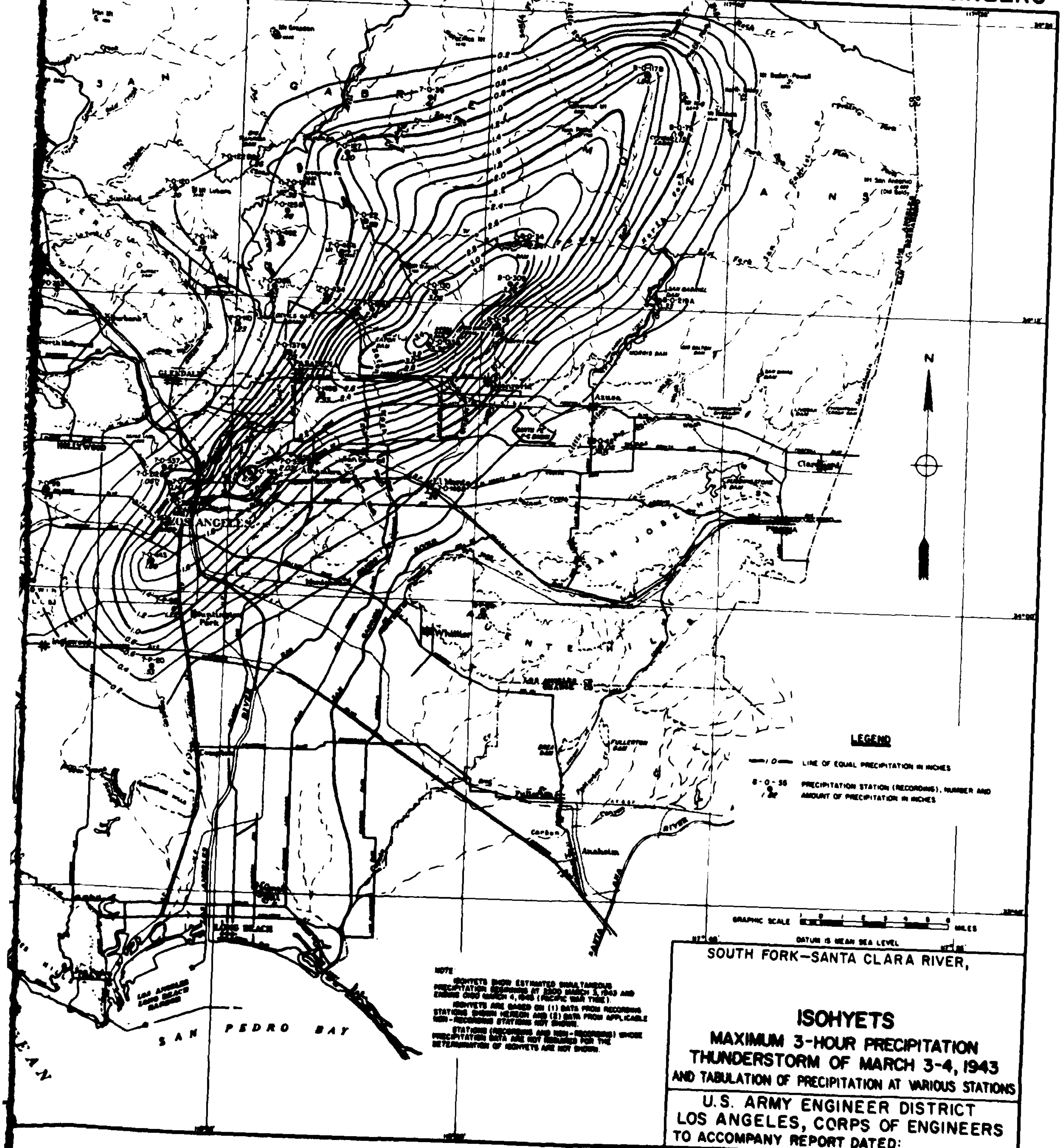
STATIONS REQUIRED FOR THE DETERMINATION OF ISOHYETS WHERE RECORDED PRECIPITATION DEPTHS WERE LESS THAN 1 INCH IN 3 HOURS

STATION	
NUMBER	NAME
7-0-[illegible]	OPID'S CAMP - CAMP [illegible]
7-0-[illegible]	LOGGING RANCH - ALDER CREEK
7-0-[illegible]	HANSEN PARK
7-0-1028	BEVERLY HILLS - NEW CITY HALL
7-0-108A	ARROYO SECO FLOOD HEADQUARTERS
7-0-110	FLINTRIDGE FIRE STATION
7-0-114	BRIGGS TERRACE - PICKENS CANYON
7-0-120	HAINES CANYON - UPPER
7-0-1220	BIG TUJUNGA DAM - NEW CARETAKER'S HOUSE
7-0-124A	CLEAR CREEK
7-0-1250	SWITZER'S CAMP
7-0-1400	EL MONTE FIRE STATION
7-0-253	BURBANK AIRPORT
7-0-434	ALTADENA COUNTY FORESTRY PARK
7-0-430	BALDWIN HILLS - STANDARD OIL FIELD OFFICE
7-0-[illegible]	PINE CANYON - ARROYO SECO
7-0-[illegible]	MT LOWE RIDGE
7-0-537	LOS ANGELES - ECHO PARK & LUCRETIA AVE
7-P-20	LOS ANGELES - 59TH & CENTRAL AVE
0-0-40	AZUSA - GRIFFITH
0-0-[illegible]A	SAN GABRIEL DAM NO. 1
0-P-20	PUENTE HILLS

RECORDED 15-MIN. PRECIPITATION AT STATIONS WHERE DEPTHS EXCEEDED 1 INCH IN 3 HOURS

STATION		PRECIPITATION IN INCHES ON MARCH 3-4 BY 15-MIN. PERIODS ENDING AS SHOWN												3-HR. TOTAL IN INCHES
NUMBER	NAME	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
7-0-204	LOS ANGELES - U S W B - 6TH & GRAND STS	0.03	[illegible]	0.21	0.10	[illegible]	[illegible]	[illegible]	0.01	[illegible]	0.03	0	0	1.40
7-0-250	LOS ANGELES - U S G S - 3RD & SPRING STS	0.11	[illegible]	[illegible]	0.16	[illegible]	0.11	[illegible]	[illegible]	[illegible]	[illegible]	0.01	0	[illegible]
7-0-127	COLBY RANCH - SLEEPY HOLLOW RANCH	0.10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.14	0.15	[illegible]	[illegible]	[illegible]
7-0-[illegible]	HOEGEE'S CAMP	0.13	0.10	[illegible]	0.11	0.37	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7-0-[illegible]	SIERRA MADRE - CARTER	0.10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.07	[illegible]	[illegible]	0.37	1.20	[illegible]	[illegible]
7-0-[illegible]	HENNINGER FLATS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.02	[illegible]
7-0-1370	PASADENA - METEOROLOGICAL STATION	[illegible]	[illegible]	0.11	0.11	[illegible]	0.07	[illegible]	[illegible]	0.11	[illegible]	[illegible]	[illegible]	[illegible]
7-0-[illegible]	CALIFORNIA TECH	[illegible]	0.13	[illegible]	0.23	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7-0-[illegible]	EL SERENO	[illegible]	0.10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.11	[illegible]	0	[illegible]	[illegible]
7-0-[illegible]	BARLOW SANITARIUM - L.A. CITY	[illegible]	[illegible]	0.15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	[illegible]	0	0	[illegible]
7-0-443	LOS ANGELES - 29TH & TRINITY STS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.13	[illegible]	0	[illegible]	[illegible]	0	[illegible]
7-0-[illegible]	LOS ANGELES - [illegible] ST.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.17	[illegible]	0.17	[illegible]	[illegible]	0	0	[illegible]
7-0-[illegible]	LOS ANGELES - [illegible] AVE.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	0	0	[illegible]	[illegible]
7-P-[illegible]	LOS ANGELES - [illegible] & LONG BEACH AVE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	0	0	[illegible]
0-0-[illegible]	SAN GABRIEL DAM NO. 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0-0-[illegible]	MONROVIA FALLS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]
0-0-75	CRYSTAL LAKE CO. PARK - C. PINE FLAT	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0-0-[illegible]	STATE FOREST CAMP NO. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.17	[illegible]	[illegible]	[illegible]
0-0-[illegible]	SANTA ANITA - SPRING CAMP	0.11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

CORPS OF ENGINEERS



SOUTH FORK—SANTA CLARA RIVER,

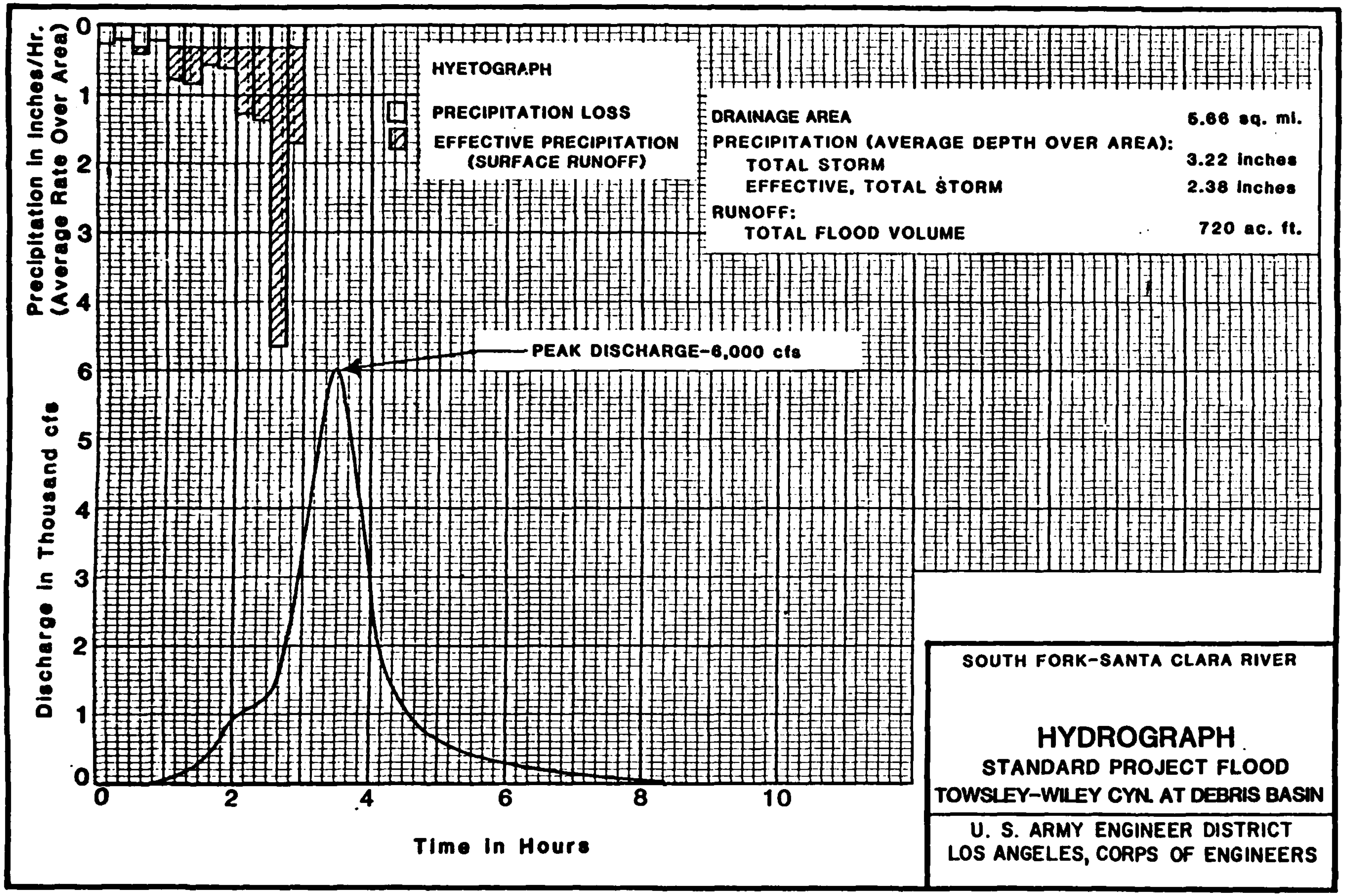
ISOHYETS

MAXIMUM 3-HOUR PRECIPITATION THUNDERSTORM OF MARCH 3-4, 1943

AND TABULATION OF PRECIPITATION AT VARIOUS STATIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS
TO ACCOMPANY REPORT DATED:

FILE NO. 220/12.1 PLATE B-6



SOUTH FORK-SANTA CLARA RIVER

HYDROGRAPH

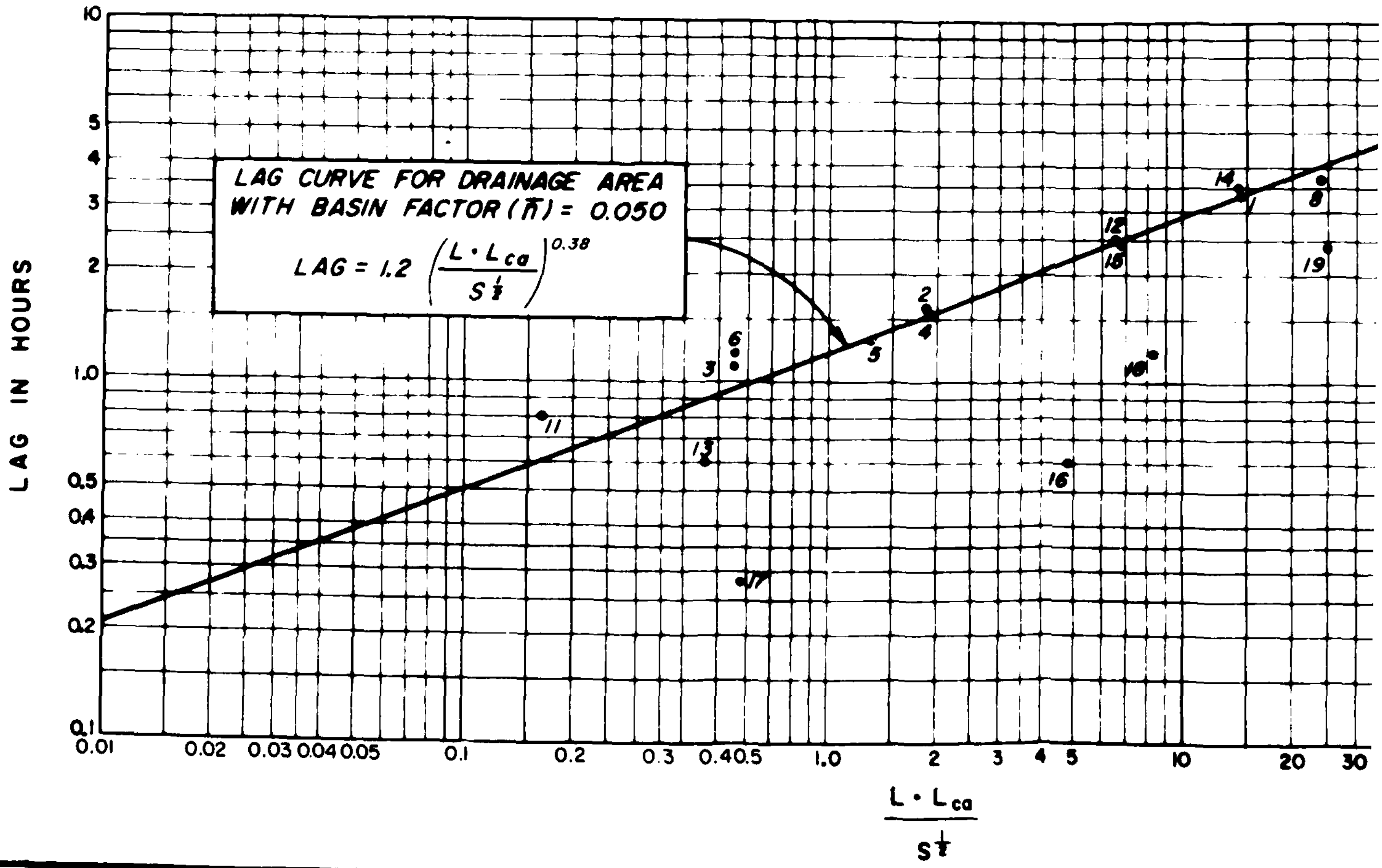
STANDARD PROJECT FLOOD

TOWSLEY-WILEY CYN. AT DEBRIS BASIN

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

PLATE B-7

		CONTRIBUTING AREA SQ. MI.	L MILES	L_{ca} MILES	S FT/MI.	LAG HOURS	ESTIM $\bar{\pi}$
1.	SAN GABRIEL RIVER AT SAN GABRIEL DAM	162.0	23.2	11.6	350	3.3	0.06
2.	WEST FORK SAN GABRIEL RIVER AT COGSWELL DAM	40.4	9.3	4.2	460	1.6	.05
3.	SANTA ANITA CREEK AT SANTA ANITA DAM	10.8	5.8	2.5	690	1.1	.0
4.	SAN DIMAS CREEK AT SAN DIMAS DAM	16.2	8.6	4.8	440	1.5	.0
5.	EATON WASH AT EATON WASH DAM	9.5	7.3	4.4	600	1.3	.0
6.	SAN ANTONIO CREEK NEAR CLAREMONT	16.9	5.9	3.0	1,017	1.2	.05
7.	SANTA CLARA RIVER NEAR SAUGUS	355.0	36.0	15.8	140	5.6	.05
8.	TEMECULA CREEK AT PAUBA CANYON	168.0	26.0	11.3	150	3.7	.05
9.	SANTA MARGARITA RIVER NEAR FALLBROOK	645.0	46.0	22.0	105	7.3	.05
10.	SANTA MARGARITA RIVER AT YSIDORA	740.0	61.2	34.3	85	9.5	.05
11.	LIVE OAK CREEK AT LIVE OAK DAM	2.3	2.9	1.5	700	.8	.07
12.	TUJUNGA CREEK AT BIG TUJUNGA DAM	81.4	15.1	7.3	290	2.5	.05
13.	EAST FULLERTON CREEK AT FULLERTON DAM	3.1	3.2	1.7	140	.6	.0
14.	LOS ANGELES RIVER AT SEPULVEDA DAM	152.0	19.0	9.0	145	3.5	.05
15.	PACOIMA WASH AT PACOIMA DAM	27.8	15.0	8.0	315	2.4	.05
16.	ALHAMBRA WASH ABOVE SHORT STREET	14.0	9.5	4.6	85	.6	.01
17.	BROADWAY DRAIN ABOVE RAYMOND DIKE	2.5	3.4	1.7	100	.28	.01
18.	BALLONA CREEK AT SAWTELLE BLVD.	88.6	11.8	5.6	64	1.2	.0
19.	SAN JOSE CREEK AT WORKMAN MILL ROAD BRIDGE	81.3	23.7	9.1	75	2.4	.0



L_{ca} MILES	S FT/MI.	LAG HOURS	ESTIMATED $\bar{n}$
11.6	350	3.3	0.050
4.2	450	1.6	.050
2.5	690	1.1	.050
4.8	440	1.5	.050
4.4	600	1.3	.050
3.0	1,017	1.2	.055
15.8	140	5.6	.050
11.3	150	3.7	.050
22.0	105	7.3	.055
34.3	85	9.5	.055
1.5	700	.8	.070
7.3	290	2.5	.050
1.7	140	.6	.035
9.0	145	3.5	.050
8.0	315	2.4	.050
4.6	85	.6	.015
1.7	100	.28	.015
5.6	64	1.2	.020
9.1	75	2.4	.030

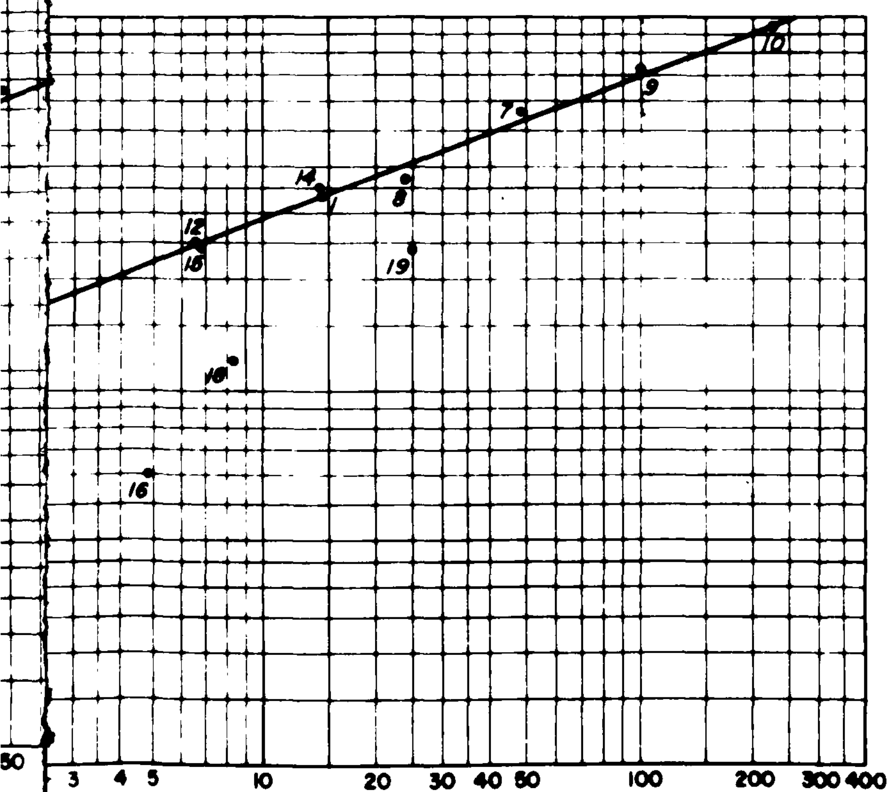
GUIDE FOR ESTIMATING BASIN FACTOR ($\bar{n}$)

$\bar{n}$=0.200: DRAINAGE AREA HAS COMPARATIVELY UNIFORM SLOPES AND SURFACE CHARACTERISTICS SUCH THAT CHANNELIZATION DOES NOT OCCUR. GROUND COVER CONSISTS OF CULTIVATED CROPS OR SUBSTANTIAL GROWTHS OF GRASS AND FAIRLY DENSE SMALL SHRUBS, CACTI, OR SIMILAR VEGETATION. NO DRAINAGE IMPROVEMENTS EXIST IN THE AREA.

$\bar{n}$=0.050: DRAINAGE AREA IS QUITE RUGGED, WITH SHARP RIDGES AND NARROW, STEEP CANYONS THROUGH WHICH WATERCOURSES MEANDER AROUND SHARP BENDS, OVER LARGE BOULDERS, AND CONSIDERABLE DEBRIS OBSTRUCTION. THE GROUND COVER, EXCLUDING SMALL AREAS OF ROCK OUTCROPS, INCLUDES MANY TREES AND CONSIDERABLE UNDERBRUSH. NO DRAINAGE IMPROVEMENTS EXIST IN THE AREA.

$\bar{n}$=0.030: DRAINAGE AREA IS GENERALLY ROLLING, WITH ROUNDED RIDGES AND MODERATE SIDE SLOPES. WATERCOURSES MEANDER IN FAIRLY STRAIGHT, UNIMPROVED CHANNELS WITH SOME BOULDERS AND LODGED DEBRIS. GROUND COVER INCLUDES SCATTERED BRUSH AND GRASSES. NO DRAINAGE IMPROVEMENTS EXIST IN THE AREA.

$\bar{n}$=0.015: DRAINAGE AREA HAS FAIRLY UNIFORM, GENTLE SLOPES WITH MOST WATERCOURSES EITHER IMPROVED OR ALONG PAVED STREETS. GROUND COVER CONSISTS OF SOME GRASSES WITH APPRECIABLE AREAS DEVELOPED TO THE EXTENT THAT A LARGE PERCENTAGE OF THE AREA IS IMPERVIOUS.



TERMINOLOGY

L = LENGTH OF LONGEST WATERCOURSE.

L_{ca} = LENGTH ALONG LONGEST WATERCOURSE, MEASURED UPSTREAM TO POINT OPPOSITE CENTER OF AREA.

S = OVERALL SLOPE OF LONGEST WATERCOURSE BETWEEN HEADWATER AND COLLECTION POINT.

LAG = ELAPSED TIME FROM BEGINNING OF UNIT PRECIPITATION TO INSTANT THAT SUMMATION HYDROGRAPH REACHES 50% OF ULTIMATE DISCHARGE.

$\bar{n}$ = VISUALLY ESTIMATED MEAN OF THE n (MANNING'S FORMULA) VALUES OF ALL THE CHANNELS WITHIN AN AREA.

NOTE:
TO OBTAIN THE LAG (IN HOURS) FOR ANY AREA, MULTIPLY THE LAG OBTAINED FROM THE CURVE BY:

$$\frac{\bar{n}}{0.050} \text{ OR } 20\bar{n}$$

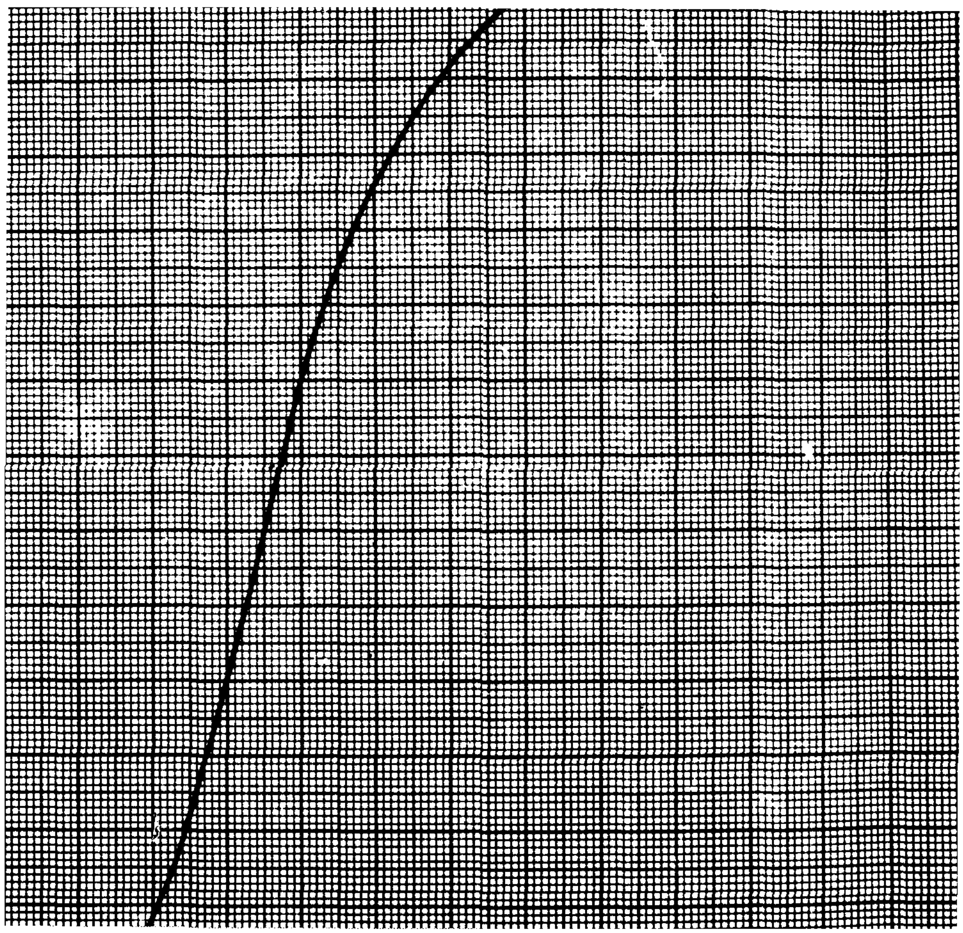
SOUTH FORK SANTA CLARA RIVER

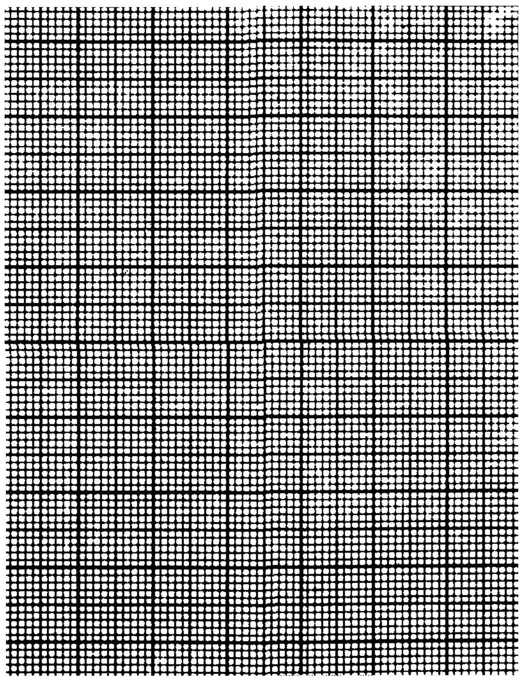
LAG RELATIONSHIPS

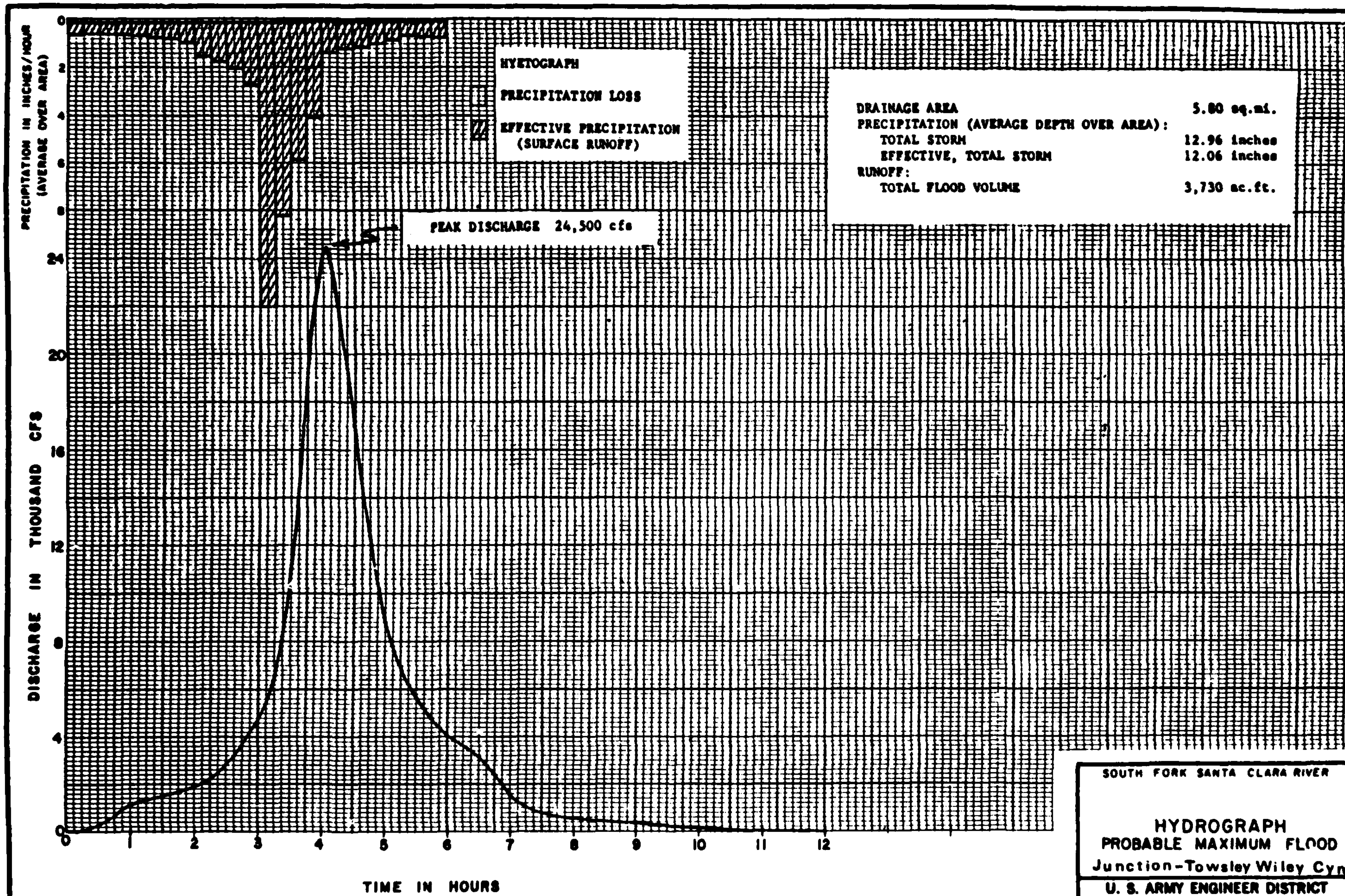
U S ARMY CORPS OF ENGINEERS
LOS ANGELES, DISTRICT

FILE NO. 224/39 PLATE B-8

2





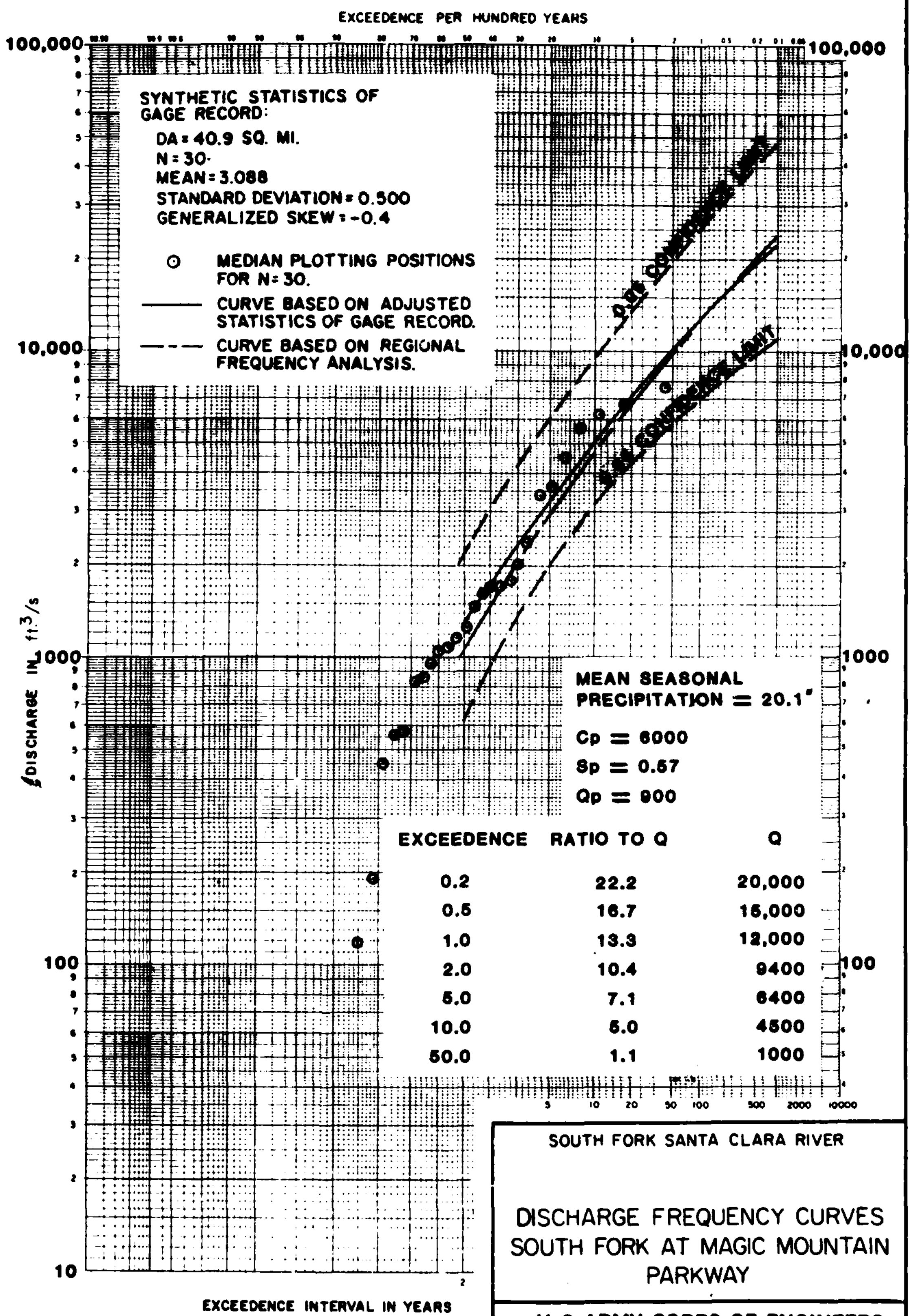


SOUTH FORK SANTA CLARA RIVER

HYDROGRAPH
PROBABLE MAXIMUM FLOOD
Junction-Towsley Wiley Cyn

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

PLATE B-10



SOUTH FORK SANTA CLARA RIVER

DISCHARGE FREQUENCY CURVES
SOUTH FORK AT MAGIC MOUNTAIN
PARKWAY

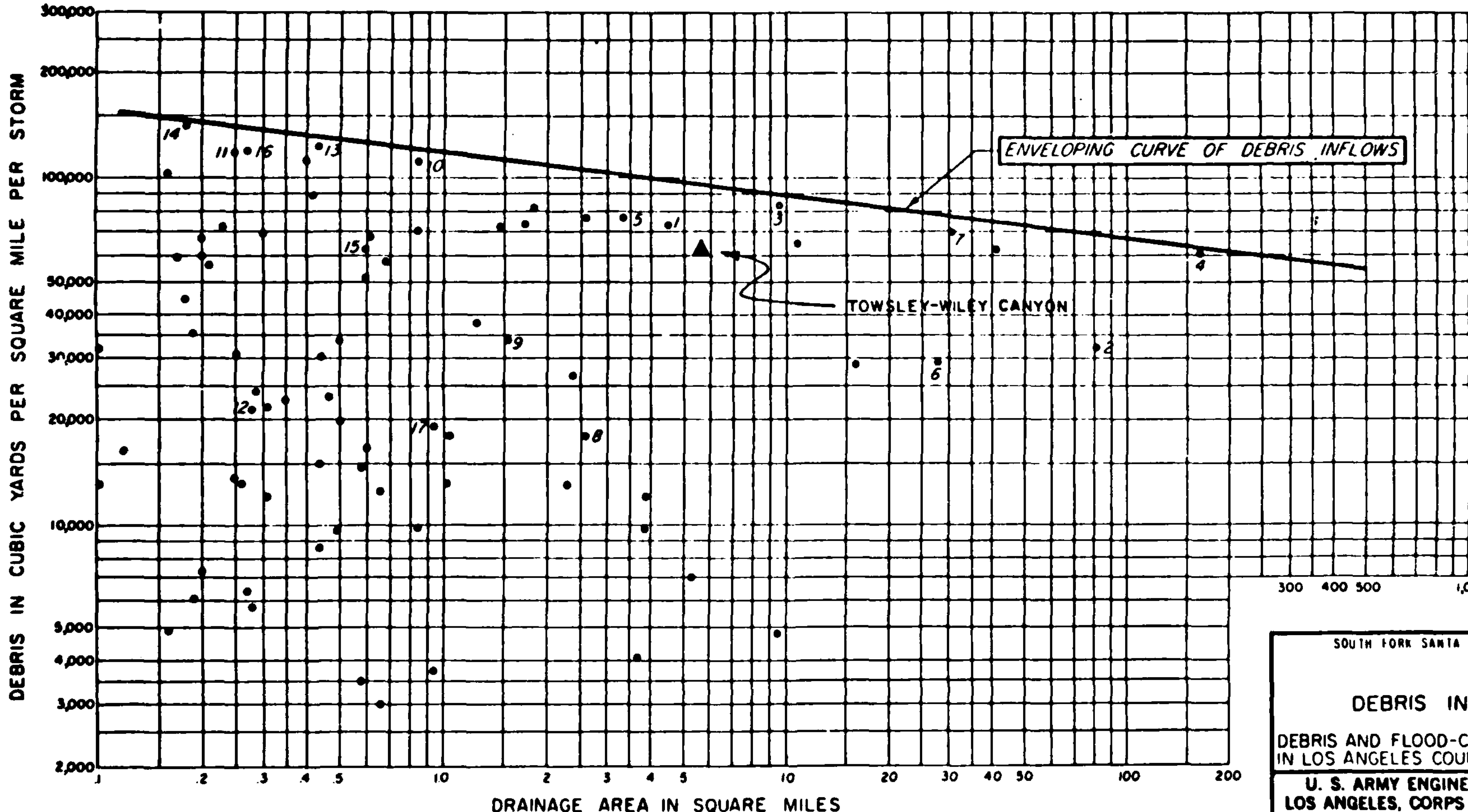
U S ARMY CORPS OF ENGINEERS
LOS ANGELES, DISTRICT

LEGEND

● RECORDED OR ESTIMATED DEBRIS INFLOW

▲ CONSIDERED DEBRIS BASIN

RESERVOIRS		DEBRIS BASINS	
1. BIG DALTON	JANUARY 1969	8. WILSON	JANUARY 1969
2. BIG TUJUNGA	MARCH 1938	9. HAINES	MARCH 1938
3. EATON WASH	MARCH 1938	10. HALL-BECKLEY	MARCH 1938
4. SAN GABRIEL	MARCH 1938	11. WEST RAVINE	MARCH 1938
5. SAWPIT	JANUARY 1969	12. RUBY	JANUARY 1969
6. PACOIMA	MARCH 1938	13. HARROW	JANUARY 1969
7. DEVIL'S GATE	MARCH 1938	14. HOOK EAST	JANUARY 1969
		15. BAILEY	JANUARY 1954
		16. SHIELDS	MARCH 1938
		17. NICHOLS	MARCH 1938



SOUTH FORK SANTA CLARA RIVER

DEBRIS INFLOWS

DEBRIS AND FLOOD-CONTROL BASINS IN LOS ANGELES COUNTY, CALIFORNIA

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

APPENDIX C

GEOLOGY, SOILS, AND MATERIALS

SUPPLEMENT TO
DETAILED PROJECT REPORT
FOR FLOOD CONTROL

SOUTH FORK OF THE SANTA CLARA RIVER
SANTA CLARITA VALLEY
CALIFORNIA

JANUARY 1985

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APPENDIX C
GEOLOGY, SOILS, AND MATERIALS
SUPPLEMENT TO DETAILED PROJECT REPORT FOR FLOOD CONTROL
SOUTH FORK OF THE SANTA CLARA RIVER
SANTA CLARITA VALLEY
CALIFORNIA

INTRODUCTION

C-01. Purpose and Scope. Geologic and soils research and investigations were accomplished to evaluate the topography, geology, and ground water conditions at the site, and to determine the extent, distribution of the soil, and physical properties of the bedrock at the site of the proposed debris basin and channel. This supplement to the appendix of the South Fork Santa Clara River, Final Detailed Project Report for Flood Control and Environmental Impact Statement, dated January 1983, describes the field investigations and presents the results of field and laboratory testing. The data presented include explorations, testing, physical characteristics of the rock and soil types, design values, methods of analyses, and design applications. Recommendations are given for foundation treatment, embankment design, subdrainage system, and construction applications.

C-02. Project Description. The proposed project is located along the South Fork of the Santa Clara River from Towsley Canyon west of the Golden State Freeway to Lyons Avenue. The proposed flood control improvements would provide standard project flood protection and would consist of a debris basin and a channel. The debris basin, Towsley Canyon Debris Basin, located at the confluence of Towsley and Wiley Canyon Creeks, would be a compacted earthfill structure, approximately 50-feet high and 700-feet long. A concrete-lined spillway capable of discharging a maximum probable flood would be built on the embankment. Two access roads would be provided to the top of the embankment and to the basin area for inspection and maintenance. The outlet channel would be designed to convey the standard project floodwaters into the existing channel at Lyons Avenue, a distance of approximately 1.6 miles. The channel would be an entrenched concrete lined rectangular section, 25 to 40-feet wide and 9 to 15.5 feet deep. A transition structure would be constructed at the confluence of the South Fork and Lyons Canyon Drain, with an additional 600 feet of concrete channel constructed in Lyons Canyon. At the proposed road crossings, the concrete channel on the South Fork would be single-barrel box culverts with clear spans of 26 to 30 feet, widths of 50 to 64 feet, and heights of 15 feet.

TOPOGRAPHY AND GEOLOGY

C-03. Topography. The Santa Clara River, to which the South Fork is a tributary, lies in the central portion of the Ventura Basin. This basin consists of numerous east-west trending mountain ranges separated by alluviated, broadly synclinal valleys, and narrow stream canyons. The eastern Santa Clara River valley region, which is one of bold relief and is bounded on the north by the Sierra Pelona Mountains (peak elevation 5,187 feet) and the

Temescal Mountains (peak elevation 2,494 feet), on the east and southeast by the San Gabriel Mountains (peak elevation 4,878 feet) and on the southwest by the Santa Susana Mountains (peak elevation 3,747 feet). The South Fork of the Santa Clara River is located in Los Angeles County in the eastern portion of the Ventura Basin. Towsley and Wiley Canyon streams are tributaries to the South Fork of the Santa Clara River, and the South Fork flows northward from Interstate 5 (the Golden State Freeway) through the towns of Newhall and Saugus before joining the Santa Clara River downstream from Bouquet Canyon, a total distance of six miles. The average slope of the streambed within the project limits is about 61 feet per mile. The other tributaries to the South Fork include Placerita and Newhall Creeks and Wildwood Canyon, which originate in the San Gabriel Mountains, and Gavin, Lyons, and Pico Canyons which originate in the Santa Susana Mountains. Most of the drainage area of the South Fork consist of steep, barren mountains.

C-04. Regional Geology. The project area is characterized by pre-Cretaceous age igneous and metamorphic rocks of the nearby San Gabriel Mountains which are the oldest rocks in the area, various types of highly folded Tertiary age sedimentary rocks of the Santa Susana Mountains and by faults of large displacement which either border the area or are found a few miles outside the project area. The Ventura Basin is part of the Transverse Range structural province. The Transverse Range structural province is typified by late Cenozoic structural deformation and strike-slip, reverse, and thrust faults of similar trend. The Ventura Basin, an elongated sedimentary syncline trending east-west is a good example of the development of the structure of this province. The Santa Clara River flows from the north side of the western San Gabriel Mountains to the Pacific Ocean south of Ventura, following this major structural depression. The pattern of tributary streams and the shapes of the ridges are commonly determined by the varying resistance of the rocks to erosion. A blanket of Holocene alluvium covers the Santa Clara River valley floor and extends far up many of the tributary valleys. The present flood plain of the Santa Clara River is entrenched into this alluvium to a depth that varies from about 20 feet near the Los Angeles County line to about 5 feet near the eastern edge of the basin. Late Pleistocene stream-terrace deposits are found throughout the Ventura Basin but are most extensive near the town of Saugus and in the immediate vicinity of the Santa Clara River. The project area lies at the eastern edge of the Ventura Basin, in an area characterized by marine and non-marine sediments of Tertiary and Quaternary age. The sediments of Tertiary age are the Pico Formation of Pliocene age, composed of marine deposits of mudstones, siltstones, sandstones and conglomerates. These sediments have a general strike of N 65° to 80°W and dip 25° to 40°NE. There are occasional exposures of overturned sediments, which strike the same direction, but dip in a southwest direction. The non-marine sediments of Quarternary age are Holocene streambed deposits, and stream terrace deposits and residual soil, both of Pleistocene age. The Terrace deposits are remains of an ancient drainage system, and are composed of silts, sands and gravels. The residual soil is composed of weathered bedrock and alluvial materials consisting of silts and sands washed down from higher slopes. The Holocene streambed deposits are silts, sands and gravels, with cobbles and boulders.

C-05. Site Geology

a. Debris Basin. The geology at the proposed debris basin site and the reservoir area was determined by a literature search, field geologic mapping, and field exploration. The materials at the debris basin site are composed of alluvial sediments and Tertiary bedrock. The alluvium is found in the active stream channels of Towsley and Wiley Canyons, and in the stream terrace deposits and residual soil (Pleistocene age). The stream terrace deposits are found outside the active channels and are the remains of an ancient drainage system. The residual soil is an apron-like deposit which masks most of the bedrock on both abutments and a portion of the stream terraces. The bedrock is part of the Pico formation of Pliocene age and is composed of mudstones, sandstones, and conglomerates. The bedrock is exposed on both abutments, in the streambed downstream of the proposed debris basin, and on the side slopes upstream of each abutment.

b. Channel. The geology of the proposed channel from the debris basin downstream to Lyons Avenue, was determined by a literature search and field exploration. The channel deposits are composed of shallow alluvial sediments consisting of silty sands and silty gravelly sands overlying tertiary bedrock. The bedrock is part of the Pico Formation and the Saugus Formation. The Pico Formation is composed of mudstones, sandstones, and conglomerates. The Saugus Formation is also composed of sandstones, and conglomerates.

C-06. Ground Water. The sediments underlying Wiley Canyon and Towsley Canyon, in the reservoir area and downstream to Lyons Avenue, are alluvial sands and gravels, underlain by sedimentary bedrock. Towsley Canyon is an intermittent stream with low flows originating from springs a few miles upstream of the project area. Analysis of the water levels measured in the test holes and the data from the logs of the test holes indicate that a perched water condition exists at the site. The ground water is found above or in the upper weathered portions of the bedrock in the alluvium or in the terrace deposits. Ground water depths are presented for test holes and trenches where it was encountered in table C-1. Test holes TH 84-1 and 84-2 were cased with perforated PVC pipe to measure ground water levels.

Table C-1. Ground Water Observations

Test Hole No.	Trench No.	Location	Depth	Date
-	84-2	Upstream Reservoir	14.0 ft.	4/84
-	84-5	Upstream Reservoir Left Side	8.0 ft.	4/84
-	84-7	Rigth Side-Near Wiley Canyon	19.0 ft.	4/84
-	84-10	Centerline of Debris	15.0 ft.	4/84

Table C-1 (Continued).

Test Hole No.	Trench No.	Location	Depth	Date
-	84-12	Streambed and ¢ Debris Basin	6.0 ft.	5/84
84-1	-	Debris Basin ¢ Left Abutment	15.5 ft.	4/84
84-1	-	Left Abutment	16.0 ft.	5/84
84-1	-	"	17.2 ft.	5/84
84-1	-	"	18.9 ft.	6/84
84-1	-	"	19.9 ft.	7/84
84-1	-	"	19.8 ft.	7/84
84-1	-	"	22.3 ft.	9/84
84-2	-	Right side of embankment	10.3 ft.	5/84
84-2	-	"	11.7 ft.	5/84
84-2	-	"	12.7 ft.	6/84
84-2	-	"	13.5 ft.	6/84
84-2	-	"	13.7 ft.	7/84
84-2	-	"	14.2 ft.	7/84
84-2	-	"	16.2 ft.	9/84
84-5	-	Channel-Station 97+37	15.0 ft.	4/84

SEISMICITY

C-07. Faults. The project area is located in an area between two major active faults, the San Andreas to the north and the San Fernando-Sierra Madre to the south. The San Andreas fault zone, which trends NW-SE is located about 20 miles to the north of the study area. The San Fernando-Sierra Madre Fault zone, located along the southern slope of the San Gabriel Mountains is about 3 to 4 miles southeast of the area. Other faults include the San Gabriel fault, which trends NW-SE and crosses the Santa Clara River about one mile north of Saugus. It is located about 4-1/2 miles northeast of the project area. The San Gabriel fault and the San Andreas exhibit right lateral strike-slip

movement. South of the project area are the NW-SE trending system of north-dipping reverse and thrust faults along which much of the uplift of the individual mountain ranges has been accomplished. The Santa Susana fault lies on the southern slope of the Santa Susana Mountains and is located about 2-3 miles south of the area. Minor faults in the vicinity of the project area include the Whitney Canyon fault that trends N-S and is located about 3-1/2 miles east of the project and the Holser fault that trends NW-SE diagonally to the Santa Clara River and is located about 4 miles north of the project. The Holser fault is inferred to intersect the San Gabriel fault east of Saugus. The Legion and Beacon faults trend NW-SE and are located approximately 2-1/2 miles northeast and 2 miles east of the project area, respectively. No faults were found in the immediate project area. The closest fault to the project is the Weldon fault, which is located about 1-1/2 miles southeast of the project and trends NW-SE. An unnamed fault, about one mile in length trending NE, is located 3 miles west of the project area. None of these minor faults are active. The locations of the major faults within a 100 mile radius of the project area are presented on plate C-1.

C-08. Earthquakes. Five earthquakes with Richter magnitudes of 6.0 or greater have occurred within a 100-mile radius of the project area. In 1857, an event with an intensity of X-XI on the Modified Mercalli scale (Richter magnitude of 8.0) occurred near Fort Tejon, approximately 30 miles north of the Santa Clara Valley. The Long Beach earthquake of 1933, with a Richter magnitude of 6.3, was located about 62 miles to the south, off Newport Beach, California. A 6.3 magnitude event located 98 miles northeast of the project site occurred in 1946, north of the Walker Pass in Kern County. In 1952, another event occurred in Kern County, with a Richter magnitude of 7.7 at Wheeler Ridge, which is about 50 miles northwest of the site. The 1971 San Fernando event, with a magnitude of 6.4, occurred only 9 miles to the east of the project area in the San Gabriel Mountains. An earthquake of magnitude 8.5 is selected to represent the event occurring along the San Andreas fault, located 20 miles northeast of the site. The bedrock accelerations at the site would be approximately 0.35 g. An earthquake of magnitude 6.5 is selected to represent the event occurring along the San Fernando-Sierra Madre front system, located 9 miles southeast of the site. The bedrock accelerations at the site would be approximately 0.30 g. From 1932 to 1984 approximately 860 earthquakes have occurred within a 100 miles radius of the project area with Richter magnitudes of 4.0 or greater. The plot of earthquake epicenters within a 100-mile radius of the project area is presented on plate C-1.

FIELD INVESTIGATIONS

C-09. Previous Field Investigations. In 1967, a preliminary subsurface field investigation was conducted at the proposed debris basin site. The exploration consisted of drilling one diamond core hole, located upstream of the centerline of the proposed structure, between the streambed and Towsley Canyon Road. The location of the test hole is presented on plate C-2.

C-10. Recent Field Investigations.

a. General. A subsurface investigation program was provided by the Los Angeles District, and investigations were conducted, under the supervision of the Los Angeles District, by the Los Angeles County Flood Control District during April and May 1984. The explorations for the debris basin and channel consisted of driving ring samplers through the alluvium and diamond cores through the bedrock. The materials encountered were visually classified in accordance with ASTM D 2488 and disturbed samples of representative materials were obtained for detailed laboratory testing. The explorations conducted for the various features are summarized in table C-2. The plan of exploration and the geologic map for the debris basin and the plan of exploration for the channel are presented on plates C-2 and C-3, respectively.

Table C-2. Summary of Explorations.

Feature	Test Holes(1)	Test Trenches(2)
Debris Basin	TH84-1 through TH84-4	TT84-1 through TT84-16
Channel	TH84-5 through TH84-12	

Notes:

(1) Drilled with either bucket auger or rotary wash drill rig, then later re-drilled with a diamond core drill rig.

(2) Excavated with dozer and backhoe.

b. Debris Basin Foundation and Borrow Areas. Four undisturbed sample test holes TH84-1, 2, 3, and 4 were drilled through the alluvium along or near the proposed centerline of the embankment with either an 18-inch diameter bucket auger or a rotary wash drill rig. A 4-inch diameter casing was placed in the hole, and the hole was backfilled. The test holes were later re-drilled through to the bedrock with a diamond core drill rig to obtain core samples. Eight disturbed sample test trenches TT84-8 through 84-15 were excavated in the foundation of the proposed embankment and eight disturbed sample test trenches TT84-1 through 84-7 and 84-16 were excavated in the upstream borrow areas with a backhoe and dozer. In-situ density tests were conducted in the excavated trenches by either the sand displacement method, ASTM 1556 or driving a 2-7/8-inch inside diameter ring sampler, ASTM D 2937. Standard penetration tests were conducted at 18-inch intervals in each test hole in accordance with ASTM D 1586. In these tests, a 140-pound hammer, with its rope wrapped twice around the cathead and a 30-inch free fall, was used to drive a standard sampling spoon having an outside diameter of 2 inches and an inside diameter of 1-3/8 inches. A record was made of the number of blows, N, required to advance the sampler one foot after the spoon was seated 6 inches into the bottom of the hole. No blow count was recorded since rocks either prevented penetration of the sampler or significantly increased the penetration resistance. The logs of the test holes and test trenches are presented on plates C-4 through C-7.

c. Channel Alinement. Eight undisturbed sample test holes TH84-5 through 84-12 were drilled along the alinement of the channel with either an 18-inch diameter bucket auger or a rotary wash drill rig. In-situ densities were conducted by driving a 2-7/8-inch inside diameter ring sampler. The materials encountered were visually classified and disturbed samples of representative materials were obtained for detailed laboratory testing. The logs of the test holes are presented on plate C-8.

FOUNDATION CONDITIONS

C-11. Foundation Conditions.

a. Debris Basin. Data from the test holes and test trenches, located near the proposed alinement of the embankment and outlet tower indicate that the alluvial materials consist of streambed deposits, terrace deposits, and residual soils that are predominantly non-plastic sandy silts, silty sands with approximately 30 percent by weight passing the No. 200 sieve, gravelly sands, and sandy gravels with as much as 20 percent cobbles and boulders up to 6 feet in diameter. The alluvium varies in thickness from 2 to 21 feet on the right abutment, and 6 to 24 feet on the left abutment. The alluvium in the active stream channel is approximately 7 feet thick. The shallow residual soil, which covers much of the abutments, is a brown to gray silty sand with occasional gravels. From the foot of the slope of the abutments to the active stream channel, the materials are silts, sands and gravels with cobbles and boulders. The alluvium in the active stream channel are silty sands, gravelly silty sands and sandy gravels with cobbles and boulders. The alluvial materials are underlain by sedimentary bedrock. The bedrock underlying the proposed embankment is predominantly a mudstone, gray to brown, moderately soft to moderately hard, weathered at the surface, but becoming harder and less weathered with depth. The bedding generally strikes N 64° to 75° W and dips 39° to 47° NE, except in the vicinity of TT84-12 in the stream channel, where the bedrock is overturned, with a strike of N 75°W and dips 24° SW. In addition, conglomerates and sandstone are found in the left abutment. The conglomerate and sandstone are white and hard. The bedding generally strikes N 64° to 80° W and dips 47° to 66° NE. Perched ground water was encountered in two of the trenches and two of the test holes located along or near the centerline of the proposed embankment. The depth to water in the observation wells on each side of the stream channel is as follows: TH84-1, left side: 22.5 feet, elevation 1351.7, and TH84-2, right side: 16.23 feet, elevation 1358.7. The perched water on the left side of the embankment is in alluvium, about 11 feet above bedrock. The water on the right side is about 4 feet below the top of soft bedrock. The depth to the perched water table varies with the elevation of the test hole and the depth to bedrock. The perched water is caused by underflow from the active stream channels, which percolates downward to the firm bedrock. The geologic profile along the centerline of the proposed debris basin is presented on plate C-9.

b. Channel. Data from test holes TH84-5 through 84-12, excavated along the existing alinement of the channel, indicate that the channel foundation materials are predominantly non-plastic silty sands and silty gravelly sands with approximately 30 percent passing the No. 200 sieve. Sedimentary bedrock

was encountered at depths above the proposed channel invert at Stations 37+13, 46+80, 51+50, 63+50, and 92+10. The bedrock was described as a sandstone, white, hard, dense in TH84-6, 84-10 through 84-12. Mudstone, gray, moderately soft with thin streaks of sandstone was encountered in TH84-5.

LABORATORY TESTS AND RESULTS

C-12. Laboratory Investigations. The laboratory investigation program was directed by the Los Angeles District, and laboratory tests were performed by the Los Angeles County Flood Control District (LACFCD) Soils Laboratory in general accordance with ASTM D 2847. The soils were classified in accordance with the Unified Soil Classification System. Grain-size analysis, Atterberg Limits tests, moisture content determinations, moisture-density relationships, consolidation tests, direct shear tests, and permeability tests were conducted in accordance with ASTM methods. Static triaxial shear tests were conducted in accordance with the procedures outlined in Bishop and Henkel(1) and incipient failure techniques were performed. A separate test was conducted to verify the results of the inicipient failure tests. The laboratory tests are summarized in table C-3. Appendix C-1 presents the results of the LACFCD laboratory tests.

Table C-3. Summary of Laboratory Tests.

Test	Procedure
Grain-Size Analysis	ASTM D 422
Atterberg Limits	ASTM D 423 and D 424
Moisture Content	ASTM D 2216
Moisture-Density	ASTM D 1557
Consolidation	ASTM D 2435
Direct Shear	ASTM D 3080
Permeability (Constant Head)	ASTM D 2434
Static Triaxial Shear (Consolidated Undrained with Pore Pressure Measurements)	Bishop and Henkel(1)

Note:
(1) Bishop, A. W. and Henkel, D. J.; Measurement of Soil Properties in the Triaxial Test, Edward Arnold, Ltd., London, 1962.

C-13. Laboratory Test Results. Detailed laboratory testing was conducted on disturbed samples of representative foundation and borrow materials compacted to 90 percent of maximum density. The 90 percent value was chosen to

approximate the expected densities in the compacted embankment materials. The samples selected for testing were generally representative of the narrow range of gradations between the upper and lower quartiles. The moisture-density relationships established by compaction studies and in-situ foundation tests were used to determine the dry and drained unit weights. The results of the laboratory tests are presented on plates C-10 and C-11.

a. Debris Basin.

(1) Density. The in-situ dry densities of the foundation, as determined by nine tests using the sand-displacement method and eleven tests using a 2-7/8-inch inside diameter drive sample, ranged from 85 to 118 pcf with an average in-situ dry density of 106 pcf. These densities correspond to 67 to 95 percent of maximum density, with an average value of 85 percent. Only one density of the nine densities determined using the sand displacement method was greater than 110 pcf. These densities indicate the foundation materials are relatively loose near the location of the proposed outlet tower and spillway to medium dense for the remainder of the site.

(2) Shear Strength. Direct shear tests were conducted on samples remolded to 90 percent of maximum density. The tests indicated that the angles of internal friction ranged from 35 to 40 degrees and that cohesion was negligible. Consolidated-undrained triaxial shear tests with pore pressure measurements were performed on samples remolded to 90 percent of maximum density. These tests indicated that the consolidated-drained strength angle of internal friction ranged from 29 to 35 degrees and cohesion would be negligible. The consolidated-undrained strength angle of internal friction ranged from 17 to 34 degrees and cohesion would be negligible.

(3) Consolidation. The consolidation tests were conducted on undisturbed samples. The curves indicate that primary consolidation, exclusive of that caused by saturation, probably would occur very rapidly.

(4) Permeability. Permeability tests were conducted on sample materials passing the No. 4 sieve remolded to 90 percent of maximum density. The tests indicated values ranging from 0.0 to 7.1 feet per day. The materials tested were not representative of the actual field conditions of the foundation due to limitations of the testing apparatus.

b. Channel.

(1) Density. The in-situ dry densities of the foundation as determined by 18 tests using a 2-7/8-inch inside diameter drive sample, ranged from 94 to 122 pcf with an average in-situ dry density of 107 pcf. These densities correspond to 75 to 90 percent of maximum density, with an average value of 85 percent.

(2) Shear Strength. Direct shear tests were conducted on samples remolded to 90 percent of maximum density. The tests indicated that the angles of internal friction ranged from 34 to 44 degrees and that cohesion was negligible. Consolidated-undrained triaxial shear tests with pore pressure measurements were performed on samples remolded to 90 percent of maximum density. These tests indicated that the consolidated-drained strength angle of internal friction would be 36 degrees and cohesion would be negligible.

(3) Consolidation. The consolidation tests were conducted on undisturbed samples. Results indicate that primary consolidation, exclusive of that caused by saturation, probably would occur very rapidly.

DESIGN CONSIDERATIONS

C-14. Design Values. The design values selected for the proposed improvements are based on conservative interpretations of the field and laboratory test results. Considerations were also given to design values selected for similar materials on major projects constructed by the Corps of Engineers. Design values selected are listed in table C-4.

a. Debris Basin. The shear strengths selected are from the results of the triaxial compression test data in accordance with the guidelines of EM 1110-2-1902, "Stability of Earth and Rockfill Dams," dated 1 April 1970. These tests indicated that the consolidated-drained strength angles of internal friction would be 31 and 35 degrees and cohesion would be negligible for the foundation and embankment materials, respectively. Consolidated-undrained strength angle of internal friction would be 26 and 29 degrees and cohesion would be negligible for the foundation and embankment materials, respectively.

b. Channel Foundation. Consolidated-drained strength characteristics were selected in order to determine lateral soil pressures. The design values indicated are based on laboratory tests of materials with similar gradations. Bearing capacity was determined for general shear conditions according to the methods outlined in EM 1110-2-1903, "Bearing Capacity of Soils," using Terzaghi's bearing capacity factors, and for allowable settlement according to the following equation from "Foundation Analysis and Design" by J. E. Bowles.

$$q_a = 1.2(N-3) \left[\frac{(B+1)}{(2B)}\right]^2 W'K_d$$

where q_a = allowable net increase in soil pressure over existing soil pressure for a settlement of 1 inch (psf)
N = standard penetration number (based on N values of similar soils)
D = depth of footing (ft)
B = width of footing (ft) (1/2 of channel width assumed)
W' = water reduction factor = 1
K_d = depth factor = 1 + D/B

An equivalent fluid pressure of at least 35 pounds per cubic foot would be used for the design of the channel walls.

Table C-4. Design Values.

Feature	Design Values
Debris Basin Foundation	γ_{dry} = 106 pcf $\gamma_{drained}$ = 117 pcf ϕ_R = 26 degrees ϕ_S = 31 degrees C = 0 psf
Compacted Fills	γ_{dry} = 112 pcf $\gamma_{drained}$ = 124 pcf ϕ_R = 29 degrees ϕ_S = 35 degrees C = 0 psf
Channel Foundation	γ_{dry} = 106 pcf $\gamma_{drained}$ = 117 pcf ϕ_S = 29 degrees C = 0 psf q_a = 4000 psf
Compacted Fills	γ_{dry} = 116 pcf $\gamma_{drained}$ = 129 pcf ϕ_S = 36 degrees C = 0 psf K_a = 0.26 EFP = 35 pcf (Channel Walls) EFP = 66 pcf (Covered Boxes)

where: γ_{dry} = dry unit weight

$\gamma_{drained}$ = drained unit weight

ϕ_R = consolidated-undrained (R) angle of internal friction

ϕ_S = consolidated-drained (S) angle of internal friction

C = cohesion

q_a = allowable bearing capacity (1/2-inch settlement)

K_a = coefficient of active pressure

EFP = equivalent fluid pressure

C-15 Design Applications. Pertinent information on the design applications for the proposed improvements are presented in the following subparagraphs.

a. Debris Basin.

(1) Embankment Section. The embankment would be a compacted, zoned, earthfill structure with a crest width of 20 feet and an upstream slope of 1V on 2.75H and a downstream slope of 1V on 2.5H. The embankment would consist of a 20-foot wide central core zone and zones of random shell material. The top of the core would be constructed to elevation 1375. An excavation trench would be excavated 15-feet deep and 15-feet wide at the bottom with side slopes of 1V on 1H. A 3-foot thick horizontal drain would be placed downstream, extending from the downstream toe of the embankment two-thirds of the distance from the toe to the core. A typical cross section is presented on plate C-12.

(2) Seepage. The horizontal drain would be provided to prevent piping and erosion by collecting and controlling through seepage and underseepage. Seepage through the embankment is unlikely however, since the detention time for the debris basin will be low (approximately 3 hours). Underseepage is expected since bedrock is at a relatively shallow depth and a perched water condition presently exists at the site.

(3) Slope Stability. Stability analyses of the embankment slopes were conducted in general accordance with EM 1110-2-1902, dated 1 April 1970. A computer program for slope stability analysis, using the modified Bishop's Procedure was used to determine the critical failure surfaces.

(a) End of Construction. The upstream and downstream slopes of the embankment were analyzed for end of construction, drained condition. In selecting the design strength values, it was assumed that consolidation occurred most significantly during construction, therefore, it was estimated that strength values were intermediate between unconsolidated-undrained (Q) and consolidated-undrained (R) strengths.

(b) Sudden Drawdown. The upstream slope of the embankment was analyzed for the condition of drawdown from the maximum water surface elevation to the invert of the intake structure. Consolidated-undrained (R) strengths were used below the phreatic surface for the embankment and foundation materials with the phreatic surface extending from the water surface at the upstream face to the downstream toe. Consolidated-drained (S) strengths were used above the phreatic surface. The phreatic surface used in the analysis is conservative because the expected period of pool storage is short, less than one day.

(c) Earthquake. Towsley Canyon Debris Basin is located in seismic risk zone 4. The slope stability analyses of the upstream and downstream slopes of the embankment were analyzed with earthquake forces by the pseudo-static method using seismic coefficient of 0.15g assuming a drained condition.

(d) Steady Seepage and Partial Pool. The embankment was not analyzed for the conditions of steady seepage and partial pool. Since the structure would have an ungated outlet and a maximum pool detention time of less than one day (approximately 3 hours), retention of significant amounts of water for extended periods of time would occur only if blockage of the outlet should occur during flood operations. This condition is considered unlikely to occur, therefore, the analyses were not performed.

The design values are presented in table C-4 and the results of the stability analyses are presented in table C-5.

Table C-5. Slope Stability Safety Factors.

	Calculated Factor of Safety	Minimum Required Factor of Safety
Upstream Slope		
Drained	1.4	1.3
Rapid Drawdown	1.2	1.0
Earthquake	1.0	1.0
Downstream Slope		
Drained	1.4	1.3
Earthquake	1.0	1.0

(4) Seismic Loading. Studies were conducted in general accordance with ER 1110-2-1806 to assess the seismicity of the sites and the effects of the slope and foundation stability. The liquefaction potential of the embankment foundation was evaluated by examining the factors influencing liquefaction. Factors known at the site which have an effect on soil liquefaction are soil saturation, grain size distribution, and density. Field investigations indicate bedrock is approximately 20 feet deep and ground water is present. This indicates that saturation of the foundation would be a likely occurrence. Analysis of the grain size data indicates that the foundation soils are not highly permeable. Visual inspection of the excavated test trenches indicate a significant portion of the foundation materials consist of cobbles and boulders. The estimated cobble and boulder content in the foundation at the debris basin site is 20 percent, however, the amount of fine-grained materials is also significant with approximately 30 percent passing the No. 200 sieve. "N" values are misleading since the cobbles and boulders either prevented penetration of the sampler or significantly increased the penetration resistence. The in-situ densities indicate the foundation is loose to medium dense. The above considerations indicate the need for a foundation treatment to preclude liquefaction and damage to the outlet tower and spillway due to seismic loading.

(5) Settlement and Subsidence. Settlements of the embankment and foundation materials due to loading of the foundation and consolidation of the embankment materials would be minimal and would occur, for the most part, during construction.

(6) Slope Protection. The upstream slope would be protected by a 6-inch thick wire-reinforced concrete slab.

(7) Foundation Treatment. The foundation treatment of the abutments would include grubbing and stripping residual soils to bedrock to provide suitable abutment contacts. The foundation treatment of the streambed materials would include dynamic deep compaction to densify the materials and minimize settlement. Dynamic deep compaction has been shown to be very effective in densifying materials to 20-foot depths.

CONSTRUCTION CONSIDERATIONS

C-16. Construction Considerations. Pertinent information on the construction of the proposed improvements are presented in the following subparagraphs.

a. Debris Basin.

(1) Embankment. The random shell zones would consist predominantly of sandy silty gravel and gravelly silty sand, with cobbles obtained by excavating and blending the required excavation of borrow area No. 1. The core material would be obtained by excavating and blending the required excavation of designated borrow area No. 2. The core material would have at least 20 percent by weight passing the No. 200 sieve. The embankment materials would be compacted with six passes of a 50-ton, rubber-tired roller. The random material for the outer shells would be placed in layers up to 18 inches in thickness and the core would be placed in 12-inch layers. Stones larger than three-fourths the layer thickness would be raked to the outer portions of the embankment. The horizontal drain would be placed under the downstream portion of the embankment and would consist of a 6-inch thick layer of sand overlain by a 2-foot thick layer of free draining gravel overlain by another 6-inch thick layer of sand. The sand, ranging in size from No. 200 to No. 4, and the gravel, ranging in size from No. 4 to 3/4 inch, would be obtained from commercial sources.

(2) Foundation Treatment.

(a) Abutments. The foundation treatment would consist of grubbing and stripping then removing the residual soils to bedrock to provide suitable abutment contacts. The bedrock surface would be sloped such that fill materials could be placed and compacted next to them. The abutment upstream of the core would be lined to an elevation 1410 with a 5-foot thick blanket of core material. A 2-foot thick drain, consisting of coarse gravel, would be placed along the downstream portion of the abutment contact and the streambed.

(b) Streambed. After clearing and grubbing is completed, dynamic deep compaction of the foundation would be performed. The dynamic deep compaction would be accomplished by dropping 10-to 20-ton weights in a grid pattern on the site. An exploration trench would be excavated and the trench bottom would be proofrolled with a 50-ton roller and then backfilled with core material. Procedures for placing the core material would be the same as those previously described for the embankment.

b. Channel.

(1) Foundation Preparation. The channel invert would be excavated to design grades, and all exposed boulders would be removed. The foundation would then be proofrolled to 90 percent maximum density to a depth of one foot for the channel invert. Required backfill for the channel invert would be compacted to at least 90 percent maximum density.

(2) Excavation. The proposed channel would be constructed by open cut with standard heavy construction equipment. Some rock excavation would be required at Stations 46+00 to 64+00 and 92+00 to 97+00. The bedrock would be rippable and could be excavated with standard construction equipment. Temporary excavation slopes would be 1V on 0.75H. For excavation where vertical cuts would be necessary, shoring would be required. Permanent excavation slopes would be 1V on 2H.

(3) Backfill Materials. Materials for the invert and wall backfill would be selected from the required excavation. The backfill material would consist mostly of gravelly sand containing cobbles. These backfill materials would be easily compacted to the specified density and would form a nonshrinking, dense backfill that would resist the water load against the channel wall. The select backfill would have a maximum size of 9 inches and less than 30 percent by weight passing the No. 200 sieve. The backfill would be placed in one-foot thick loose lifts and compacted to at least 90 percent of maximum density as determined by ASTM D 1557. Flooding or jetting of the backfill would not be permitted.

(4) Subdrainage Systems. Subdrainage systems would be required to control uplift pressures due to perched water along the channel. Subdrainage systems would be required for the reach between stations 84+00 and 99+00. This subdrainage system would have a 6-inch thick gravel layer placed between a 6-inch layer of filter material and the channel invert. The subdrainage systems would discharge through outlets at 500-foot intervals.

c. Spillway. The spillway would be placed directly on the compacted embankment and would be underlain by a 5-foot thick, horizontal layer of material free from cobbles and compacted to 90 percent of maximum density. The lower end of the spillway from the crest to where the invert meets the natural ground would be underlain with a 3-foot thick layer of cobble-free material. The cobble-free material would facilitate fine grading of the spillway subgrade and trenching for the construction of the cutoff trench. A subdrainage system would be required under the spillway inverts to relieve uplift pressures from through seepage and from rapid drawdown of water flowing over the spillway. The system would have transverse subdrains spaced at

approximately 60-foot intervals. The first drain would be installed at the crest and the last one at the end of the spillway. The drains would be 6-inch perforated pipes embedded in gravel and parallel to the embankment crest. They would discharge in nonperforated pipes behind the spillway walls. The nonperforated pipes would be on a flat grade and would discharge near the top of the wall above the maximum spillway water surface.

d. Outlet Works. The outlet works (tower and pipe) would be founded on the alluvium. The foundation would be proofrolled with a 50-ton roller. Select backfill free of material larger than 2 inches, would be compacted around the outlet pipe.

CONSTRUCTION MATERIALS

C-17. Sources of Stone. Within Ventura and western Los Angeles Counties, there are several rock quarries listed in the California Division of Mines and Geology Special Publication No. 43, Mines and Mineral Producers Active in California, dated 1978, which have been investigated and may be potential sources of rip rap material. L.S. Hawley Corporation operates Rancho and Hawley quarries, both of which mine the Conejo Volcanics near Camarillo, approximately 30 miles SW of the project area. The average specific gravity of samples tested from 1959 through 1973 was 2.50, ranging from 2.41 to 2.71. Schmidt Construction Company operates Wheeler Gorge Quarry, formerly known as Bostwick Quarry, located in Wheeler Gorge above Ojai, approximately 40 miles west of the site. This quarry produces stone from the Matilija Formation, a marine sandstone, with a specific gravity from 2.61 to 266. Both of these quarries are capable at the present time of producing enough stone for the project.

APPENDIX C-1

SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT
REPORT OF SOILS TESTS

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

SEPTEMBER 1984

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

XXXXXXXXXXXX

September 21, 1984

(213) 226-4281

IN REPLY PLEASE REFER TO
FILE NO. 337.41 395.41
Santa Clara River-South Fork
Towsley Canyon Debris Basin
Summary of Laboratory Test Data

Col. Dennis F. Butler
District Engineer
Department of the Army
Los Angeles District, Corps of Engineers
P.O. Box 2711
Los Angeles, CA 90053

Attention Ms. Arleen A. Arita

Dear Colonel Butler:

Enclosed is a summary of the results of all laboratory tests which you requested be performed on soil samples recovered during our soil exploration for the debris basin and channel. Individual test results and District drawings showing the location of borings and trenches made during the exploration have already been transmitted to Ms. Arita.

This completes our work for the debris basin and channel.

If you have any questions regarding the enclosed information, please contact Mr. Todd Dudley at the telephone number indicated above.

Yours very truly,

Norman Bradley, Head
Geotechnical Engineering Section
Contract Administration Division

TD:sl

Enc. 33

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SUMMARY OF LABORATORY TEST METHODS

Samples were taken to the Los Angeles County Flood Control District's soils laboratory for additional testing. The laboratory test results are summarized beginning on page 5. The following test procedures were used.

Atterberg Limits

Liquid and plastic limits were determined and the plasticity index was calculated using ASTM Methods D 423-66 and D 424-59.

Consolidation Tests

The consolidation properties of the project soils were determined in accordance with ASTM Method D 2435-80.

Laboratory Maximum Compaction

ASTM Method D 1557-78 was used to determine the laboratory maximum compaction properties of the project soils, except as noted on the summary sheets.

Moisture Content

The moisture content of the soil was determined in accordance with ASTM Method D 2216-71.

Particle - Size Analysis of Soils

The grain-size distributions of the project soils were determined in general accordance with ASTM Method D 422-63, except that non-standard sieve sizes were used, as requested by the Corps of Engineers.

Permeability Test

Constant head permeabilities of the project soils were determined in accordance with ASTM Method D 2434-68.

Shear Strength Using Direct Shear Testing Apparatus

The direct shear test was performed in accordance with ASTM Method D 3080-72.

Shear Strength Using Triaxial Testing Apparatus

Representative specimens of the project soils were remolded to a relative compaction of 90%, and tested on the triaxial shear machine under consolidated-undrained (CU) test conditions.

The incipient failure method was used in order to determine the shear strength properties of a given soil using only one sample. As a requirement of the test method, the specimens were saturated prior to testing so that the pore pressure could be monitored. During the test a constant rate of strain of 0.01 in./min. was applied along the axis of the specimens until the principal stress ratio reached a maximum value.

At this point the deviator stress was removed and the confining pressure was increased. When the pore pressure of the sample stabilized at the same value as was indicated before testing had begun, another test was performed.

This procedure was repeated three times. The confining pressures used were 15, 30, and 45 psi. Mohr diagrams were used for the graphical determination of the effective soil strength parameters.

Soil Density (Unit Weight)

Sand-Cone tests, ASTM Method D 1556-82, and Drive-Cylinder tests, ASTM Method D 2937-71 (1976), were used to determine the in-place density of the project soils.

Soils Classification

Soil classifications were determined in accordance with the Unified Soil Classification System (ASTM Method D 2487-69).

GUIDE TO LABORATORY SUMMARY SHEETS

Boring Number

In the column marked "Boring No." some boxes have a small "c" or a capital "RC" in the upper left hand corner. The small "c" designates an undisturbed ring sample on which a consolidation test was run. The capital "RC" indicates that a consolidation test was run on a specimen which was remolded to ninety percent relative compaction (90% R.C.).

Group Symbol

In the column marked "U.S.C. Group Symbol" some of the group symbols are preceded by an asterisk (*). This asterisk indicates that the classification was made in the field. All other group symbols were determined through laboratory analysis.

Note: If two or more samples were recovered from a single boring at the same depth, a classification analysis was run on only one sample. The same group symbol was then assigned to each sample recovered from that boring at that depth. Each sample which was classified in this way is considered to have been classified in the laboratory.

Gradation

Percentage, by weight, of samples passing the numbers 4 and 200 sieve sizes are shown in the column labeled "Gradation". A complete listing of sieve sizes and the accumulative percentage of soil retained on each sieve is given on the pages following the laboratory summary sheets.

Atterberg Limits

In the column labeled "Att. Limits" a dash (-) indicates where a test was begun and could not be finished due to the low plasticity of the soil.

Laboratory Compaction

In the columns marked "Lab Compaction" two (2) test results are preceded by hash marks (#). These test results were arrived at using Calif. Test 216. All other tests were performed in accordance with ASTM Method D 1557-78.

Permeability

In the column labeled "Perm." a dash (-) is used to indicate a sample which was tested but would allow no water to pass through within a two week period of time.

Note: All permeability tests were constant-head tests run on specimens which were remolded to ninty percent relative compaction (90% R.C.). The specimens were remolded using only the material passing the No. 4 sieve (- 4).

Shear Strength

Under the subheading "Test Type", "D.S." indicates a direct shear test; "T" indicates the result of a triaxial shear test. Triaxial shear tests were run under consolidated - undrained conditions.

Boring No.	Sample No.	Sample Depth (ft)	Serial No.	U.S.C. Group Symbol	Gradation -4 (%)	Gradation -200 (%)	Att. Limits LL (%)	Att. Limits PI (%)	Lab Compaction Dry Density (pcf)	Lab Compaction Optimum Moist. (%)	Field Conditions Dry Density (pcf)	Field Conditions Moist. Content (%)	Perm. (ft/day)	Shear Strength Ø, Deg. Max	Shear Strength Ø, Deg. Ult	Shear Strength C, psf Max	Shear Strength C, psf Ult	Test Type
1	1	4.5	39375	SM							109.8	8.9		41	41	0	0	D.S.
	2	4.5	39376	SM	83.9	22.5	-	-	133.3	7.8								
	3	7.0	39377	SM	74.3	26.5			132.4	7.8				32		540		T
2	1	26.0	39378	SW-SM	64.8	9.4												
3	1	4.0	39369	SM							108.2	3.6						
	2	4.0	39370	SM	65.5	17.4												
	3	10.0	39371	SM							112.6	4.5						
	4	10.0	39372	SM	70.2	20.4			133.7	8.0				33		570		T
	5	15.0	39373	SM							109.5	4.7		36	34	250	75	D.S.
	6	15.0	39374	SM	85.3	14.2												
4	1	2.0	39386	SM							101.4	6.9						
	2	2.0	39387	SM	97.3	33.3												
	3	4.0	39388	GM	52.1	17.1			134.1	6.3				31		580		T
	4	8.0	39389	GM							121.8	5.7						
	5	8.0	39390	GM	58.9	18.2	-	-	134.9	7.8				31		1150		T
5	1	5.0	39379	SM							97.7	8.1		35	35	170	170	D.S.
	2	5.0	39380	SM	79.6	32.3	-	-	125.3	11.1								
c	3	10.0	39381	SM							101.1	8.2		37	37	0	0	D.S.
	4	10.0	39382	SM	98.4	32.3			124.3	10.3								

Boring No.	Sample		Serial No.	U.S.C. Group Symbol	Gradation		Att. Limits		Lab Compaction		Field Conditions		Perm.	Shear Strength				
	No.	Depth (ft)			-4 (%)	-200 (%)	LL (%)	PI (%)	Dry Density (pcf)	Optimum Moist. (%)	Dry Density (pcf)	Moist. Content (%)	(ft/day)	Ø, Deg. Max	Ø, Deg. Ult	C, psf Max	C, psf Ult	Test Type
5	5	14.0	39383	SM	100.0	44.6					110.8	13.8						
	6	18.5	39384	GP	11.9	2.9												
	7	25.0	39385	*SC														
6	1	4.0	39360	SC-SM	62.1	23.7	28	6	130.1	7.7								
	2	7.0	39361	SM							101.7	10.5						
	3	7.0	39362	SM	95.6	34.4			124.3	10.5				35		500		T
	4	10.0	39363	SW-SM							113.7	3.1						
	5	10.0	39364	SW-SM	85.9	11.5			124.0	9.1				35		290		T
c	6	16.0	39365	SM							99.1	13.9						
	7	16.0	39366	SM	58.0	15.1			134.5	7.2								
	8	20.0	39367	SC-SM							116.6	8.8		38	38	25	25	D.S.
	9	20.0	39368	SC-SM	64.4	22.6	24	5										
7	1	4.0	39355	SM							106.6	3.5						
	2	4.0	39356	SM	71.8	16.7			125.9	10.0				30		860		T
	3	18.0	39358	*SM							116.6	12.5		41	39	150	0	D.S.
8	1	5.0	39350	*ML							97.0	18.5		32	34	129	52	D.S
	2	7.5	39467	SM	69.6	15.2	-	-	125.2	10.0				34		400		T
	3	10.0	39351	CL	98.6	78.7	31	13			93.6	16.8		44	44	0	0	D.S.
	4	15.0	39352	CL	94.4	70.1	31	10			105.0	15.3						
	5	20.5	39353	ML	100.0	98.8	34	9			104.0	19.2		43	37	300	175	D.S.

Boring No.	Sample		Serial No.	U.S.C. Group Symbol	Gradation		Att. Limits		Lab Compaction		Field Conditions		Perm.	Shear Strength				
														Ø, Deg.		C, psf		Test
	No.	Depth (ft)			-4 (%)	-200 (%)	LL (%)	PI (%)	Dry Density (pcf)	Optimum Moist. (%)	Dry Density (pcf)	Moist. Content (%)	(ft/day)	Max	Ult	Max	Ult	Type
8	6	25.5	39354	CL	100.0	91.2	35	13										
9	1	4.0	39318	GM							116.6	4.4						
	2	4.0	39319	GM	63.0	27.1	30	7	#124.9	#10.0				29		432		T
c	3	7.0	39320	SM							114.5	7.4						
	4	7.0	39321	SM	77.0	17.8			#125.3	#10.5			.43	35		360		T
	9	7.0	39326	*SM														
	5	10.0	39322	GM	53.7	17.9												
	6	12.7	39323	GM	53.1	20.4												
	10	12.0	39327	*CL														
	7	13.5	39324	*SC							112.0	5.1						
	8	13.5	39325	SM-SC	70.4	26.5	27	6	130.1	8.4								
	11	18.0	39328	*SC														
	12	23.0	39329	*MH														
	13	26.0	39330	ML	100.0	93.8	-	-										
10	1	4.5	39331	SM	65.1	30.1												
c	2	5.5	39332	SC							95.9	13.4						
	3	5.5	39333	SC	92.5	48.5	30	10	123.6	12.1				29		648		T
	4	8.0	39334	SM	84.3	34.3												
	5	13.0	39335	*CL							118.1	14.8						
	6	16.0	39336	CL	100.0	97.2	37	16										

Boring No.	Sample No.	Sample Depth (ft)	Serial No.	U.S.C. Group Symbol	Gradation -4 (%)	Gradation -200 (%)	Att. Limits LL (%)	Att. Limits PI (%)	Lab Compaction Dry Density (pcf)	Lab Compaction Optimum Moist. (%)	Field Conditions Dry Density (pcf)	Field Conditions Moist. Content (%)	Perm. (ft/day)	Shear Strength Ø, Deg. Max	Shear Strength Ø, Deg. Ult	Shear Strength C, psf Max	Shear Strength C, psf Ult	Test Type
11	1	3.0	39337	SM	64.8	26.4			124.0	11.5			-					
	2	4.0	39338	*GM							100.2	9.6						
	3	5.0	39339	GM	46.2	21.5			124.1	10.4				33		216		T
	5	8.5	39341	CL							112.2	16.4		39	48	1299	0	D.S.
	6	8.5	39342	CL	98.6	90.6	39	17	117.5	15.0				33		72		T
	7	13.5	39343	ML							114.9	13.5		64	35	215	122	D.S.
	8	13.5	39344	ML	100.0	86.1	34	10										
12	1	3.5	39345	SM							104.4	10.0						
	2	3.5	39346	SM	95.3	40.6			123.2	11.0			.004	28		0		T
	3	3.5	39347	SM														
	4	17.0	39465	*SM														
	5	20.0	39466	*MH														
T1	1	2.5	39391	ML	97.4	54.8	-	-										
	2	5.0	39392	SM	98.2	13.7												
	3	5.5	39393	GW-GM							105.4	9.1						
	4	5.5	39394	GW-GM	48.5	5.7			126.8	10.2								
	5	11.0	39395	GP-GM							116.4	4.2						
	6A	11.0	39396	GP-GM	47.7	6.6			130.4	9.5			.35					
	6B	11.0	39397	GP-GM	41.6	5.6												
T2	1	2.0	39398	ML	98.4	59.4	-	-										

Boring No.	Sample No.	Sample Depth (ft)	Serial No.	U.S.C. Group Symbol	Gradation -4 (%)	Gradation -200 (%)	Att. Limits LL (%)	Att. Limits PI (%)	Lab Compaction Dry Density (pcf)	Lab Compaction Optimum Moist. (%)	Field Conditions Dry Density (pcf)	Field Conditions Moist. Content (%)	Perm. (ft/day)	Shear Strength Ø, Deg. Max	Shear Strength Ø, Deg. Ult	Shear Strength C, psf Max	Shear Strength C, psf Ult	Test Type
T2	2	5.0	39399	ML							111.9	8.1						
	3	5.0	39400	ML	97.0	50.9												
	5	9.0	39402	SW-SM	65.8	7.7												
	6	10.0	39403	SM							138.4	6.2						
	7	10.0	39404	SM	94.7	30.7			122.5	11.3								
	8	12.0	39405	SP-SM	67.2	10.7												
T3	1	3.5	39437	CL							89.3	13.9						
	2	3.5	39438	CL	99.5	68.7	34	11	118.5	13.7								
	3	8.0	39439	CL	99.7	70.9	28	8										
	4	13.0	39440	CL-ML	99.7	70.6	27	6										
T4	1	3.0	39441	ML	98.8	58.8	25	4										
	2	5.0	39442	ML							93.4	10.3						
	3	5.0	39443	ML	98.7	55.1	-	-	122.3	11.1								
	4	10.0	39444	SM							103.4	11.5						
	5	10.0	39445	SM	96.3	46.8	23	2	123.0	11.5			.31					
	6	15.0	39446	ML	98.8	65.9	28	4										
	7	19.5	39447	SM	94.2	39.7	-	-										
T6	1A	3.0	39406	GW-GM	46.0	6.2												
	1B	2.0	39407	ML							98.5	8.5						
	2B	2.0	39408	ML	94.6	65.6	-	-	124.5	11.0								

Boring No.	Sample No.	Sample Depth (ft)	Serial No.	U.S.C. Group Symbol	Gradation -4 (%)	Gradation -200 (%)	Att. Limits LL (%)	Att. Limits PI (%)	Lab Compaction Dry Density (pcf)	Lab Compaction Optimum Moist. (%)	Field Conditions Dry Density (pcf)	Field Conditions Moist. Content (%)	Perm. (ft/day)	Shear Strength Ø, Deg. Max	Shear Strength Ø, Deg. Ult	Shear Strength C, psf Max	Shear Strength C, psf Ult	Test Type
T6	3B	6.0	39409	SM	93.9	22.0			118.2	12.0			-					
T7	1	1.0	39448	CL	90.3	53.7	36	14										
	2	5.5	39449	GM							108.0	6.4						
	3	5.5	39450	GM	49.8	14.6												
	4	12.0	39451	GP-GM	19.8	7.9												
	5	15.0	39452	SM	60.5	18.7												
	6	19.0	39453	ML	91.8	57.9	33	7										
T8	1	0.0	39410	CL	99.6	68.6	30	9										
	2	4.5	39411	SM							107.6	5.0						
	3	4.5	39412	SM	67.4	22.6			128.0	9.3								
	4	8.0	39413	GM	53.9	14.1												
T12	1	5.0	39454	GM							105.2	6.4						
	2	5.0	39455	GM	42.1	20.7			121.1	11.7			-					
	4	9.5	39457	SM							110.0	7.8						
RC	5	9.5	39458	SM	96.8	45.6	-	-	122.4	12.0								
	6	18.0	39459	GM							106.5	5.7						
	7	18.0	39460	GM	56.3	14.7			125.4	9.0			.08					
T13	1	3.0	39414	SM	93.1	15.2	27	4										
	2	5.0	39415	ML							101.4	14.5						

Boring No.	Sample		Serial No.	U.S.C. Group Symbol	Gradation		Att. Limits		Lab Compaction		Field Conditions		Perm.	Shear Strength				
														Ø, Deg.		C, psf		Test
	No.	Depth (ft)			-4 (%)	-200 (%)	LL (%)	PI (%)	Dry Density (pcf)	Optimum Moist. (%)	Dry Density (pcf)	Moist. Content (%)	(ft/day)	Max	Ult	Max	Ult	Type
T13	3	5.0	39416	ML	89.3	52.5			121.0	12.7				33		130		T
	4	6.0	39417	SM	93.6	44.3	-	-										
	5	9.0	39418	GM							85.1	11.0						
	6	9.0	39419	GM	63.5	28.8			126.7	9.2								
RC	7	14.0	39419A	SM	95.1	42.2												
T14	1	1.5	39420	ML	98.1	73.0	29	6										
	2	4.0	39421	SM	69.2	29.2												
	3	6.0	39422	SP-SM	88.5	11.7												
	4	9.0	39423	GW-GM							108.1	3.1						
	5	9.0	39424	GW-GM	38.0	7.0			131.9	8.9			-	32		864		T
	6	11.0	39425	GW-GM	48.3	9.1												
	7	14.0	39426	GP-GM	49.0	8.0			127.7	9.3								
T15	1	3.5	39427	SP-SM							107.4	2.8						
	2	3.5	39428	SP-SM	61.7	11.3			126.9	9.7				35		288		T
T16	1	4.0	39430	GW-GM	44.2	5.5			123.3	8.9			7.08					
	2	6.5	39431	ML	100.0	91.2	36	10										
TP3	2	6.0	39433	*MH							100.1	15.0						

Classifications

Accumulative Percentage of Total Sample Retained

Boring No.	Depth (F)	Serial No.	1-1/2"	1"	3/4"	Sieve Size 3/8"	#4	#10	#16	#40	#100	#200	LL	PI	USCS
1	4.5	39376	2.1	4.0	5.6	10.5	16.1	23.7	33.7	51.9	70.3	77.5	—	—	SM
1	7.0	39377	2.4	5.4	8.1	16.2	25.7	33.2	41.4	55.4	69.4	73.5			SM
2	26.0	39378	0	0	0	16.0	35.2	49.3	62.6	74.0	86.3	90.6			SW-SM
3	4.0	39370	4.2	9.8	13.7	24.2	34.5	40.5	45.6	53.0	72.2	82.6			SM
3	10.0	39372	1.6	3.7	7.8	18.4	29.8	40.0	50.0	61.7	73.7	79.6			SM
3	15.0	39374	3.2	4.9	6.1	10.0	14.7	20.3	31.9	61.1	80.1	85.8			SM
4	2.0	39387	0	0.4	1.1	1.8	2.7	3.9	6.0	13.9	43.7	66.7			SM
4	4.0	39388	21.0	30.0	34.2	42.1	47.9	52.0	55.1	61.4	74.2	82.9			GM
4	8.0	39390	7.5	14.5	20.4	33.5	41.1	47.9	52.9	61.8	75.2	81.8	—	—	GM
5	5.0	39380	2.6	4.4	6.8	15.0	20.4	24.6	29.6	38.6	53.8	67.7	—	—	SM
5	10.0	39382	0.4	0.5	0.5	1.1	1.6	2.8	6.7	19.4	46.3	67.7			SM
5	14.0	39383	0	0	0	0	0	1.1	2.0	6.6	29.2	55.4			SM
5	18.5	39384	0	0	66.7	74.8	88.1	90.0	92.0	94.5	96.4	97.1			GP
6	4.0	39360	4.4	10.4	14.9	25.3	37.9					76.3	28	6	SC-SM
6	7.0	39362	0.6	0.6	1.3	2.6	4.4	5.4	8.1	20.5	47.8	65.6			SM
6	10.0	39364	0.6	2.5	3.8	8.5	14.1	*20.0	23.9	*49.6	79.8	88.5			SW-SM
6	16.0	39366	3.3	8.6	15.2	29.1	41.9	51.6	57.9	66.4	78.6	84.9			SM
6	20.0	39368	4.3	6.9	11.1	22.4	35.6	43.4	49.7	58.5	70.5	77.4	24	5	SC-SM

Boring No.	Depth (F)	Serial No.	Sieve Size 1-1/2"	1"	3/4"	3/8"	#4	#10	#16	#40	#100	#200	LL	PI	USCS
7	4.0	39356	2.1	5.1	9.6	19.1	28.2	36.1	42.7	54.8	74.7	83.3			SM
8	7.5	39467	2.1	5.6	9.3	18.5	30.4	38.3	48.5	64.4	79.1	84.8	—	—	SM
8	10.0	39351	0	0	0	0	1.4					21.3	31	13	CL
8	15.0	39352	0	0	0	4.2	5.6	6.8	8.6	11.9	18.8	29.9	31	10	CL
8	20.5	39353	0	0	0	0	0					1.2	34	9	ML
8	25.5	39354	0	0	0	0	0					8.8	35	13	CL
9	4.0	39319	6.8	13.1	18.7	30.1	37.0	*47.5	54.9	*62.4	68.3	72.9	30	7	GM
9	7.0	39321	1.7	5.8	9.0	16.6	23.0	*31.7	41.2	*62.2	76.5	82.2			SM
9	10.0	39322	13.4	20.0	25.2	36.8	46.3	53.3	59.8	69.0	77.8	82.1			GM
9	12.7	39323	13.6	22.8	27.6	37.9	46.9	52.7	59.1	66.9	74.6	79.6			GM
9	13.5	39325	2.8	10.3	14.9	22.9	29.6	*37.7	45.6	*57.2	67.3	73.5	27	6	SM-SC
9	26.0	39330	0	0	0	0	0					6.2	—	—	ML
10	4.5	39331	9.9	14.2	17.8	26.6	34.9	40.9	46.3	53.4	63.6	69.9			SM
10	5.5	39333	0	1.3	2.4	5.2	7.5	10.3	13.5	22.7	40.0	51.5	30	10	SC
10	8.0	39334	0	0	4.7	9.4	15.7					65.7			SM
10	16.0	39336	0	0	0	0	0					2.8	37	16	CL
11	3.0	39337	7.6	10.2	13.5	24.2	35.2	47.9	55.9	63.4	69.5	73.6			SM
11	5.0	39339	10.7	18.6	25.6	41.0	53.8	60.0	63.8	67.8	73.8	78.5			GM
11	8.5	39342	0	0	0.3	0.9	1.4					9.4	39	17	CL
11	13.5	39344	0	0	0	0	0	0.8	1.4	2.2	5.0	13.9	34	10	ML

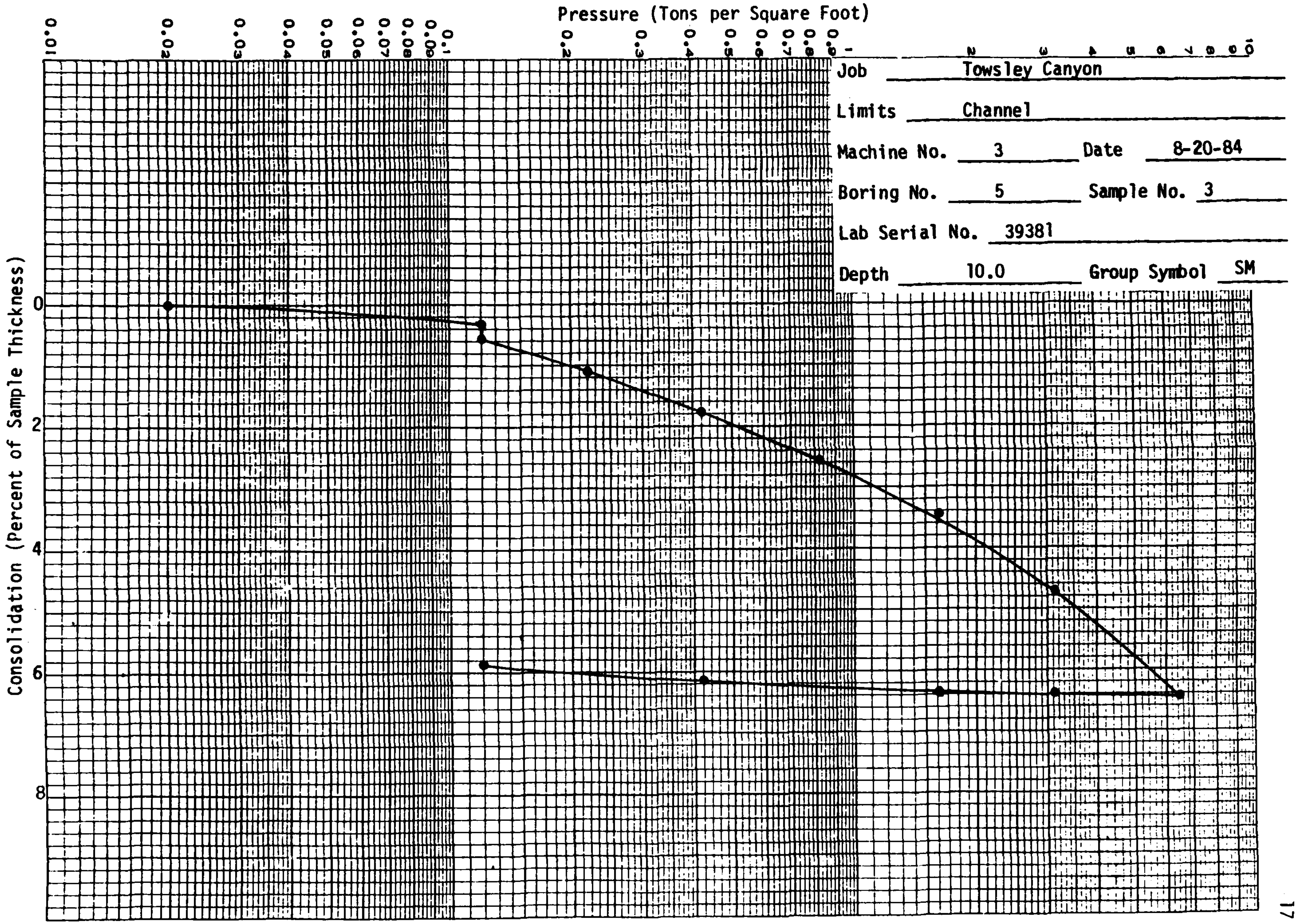
[illegible]	Depth (F)	Serial No.	1-1/2"	1"	3/4"	3/8"	Sieve #4	Size #10	#16	#40	#100	#200	LL	PI	USCS
[illegible]	3.5	39346	0	0.6	1.2	2.2	4.7	10.0	13.8	20.1	39.5	59.4			SM
T1	2.5	39391	0	1.3	1.3	2.0	2.6					45.2	—	—	ML
T1	5.0	39392	0	0	0	1.6	1.8	12.9	34.3	62.4	79.8	86.3			SM
T1	5.5	39394	5.3	11.2	17.1	31.8	51.5	65.4	76.6	86.6	92.1	94.3			GW-GM
T1	11.0	39396	19.2	29.3	34.5	44.0	52.3	59.9	66.6	79.4	90.1	93.4			GP-GM
T1	11.0	39397	22.0	36.5	41.3	51.6	58.4	65.5	71.8	82.6	91.7	94.4			GP-GM
T2	2.0	39398	0	0	0	0.5	1.6					40.6	—	—	ML
T2	5.0	39400	0	0.3	0.7	1.8	3.0	6.4	10.3	18.1	35.5	49.1			ML
T2	9.0	39402	0	1.4	5.3	16.5	34.2	56.4	70.1	82.5	89.7	92.3			SW-SM
T2	10.0	39404	0	1.1	2.0	3.3	5.3	7.9	11.8	24.6	52.2	69.3			SM
T2	12.0	39405	2.4	4.9	8.5	21.7	32.8	49.4	63.1	77.7	86.2	89.3			SP-SM
T3	3.5	39438	0	0	0	0.3	0.5					31.3	34	11	CL
T3	8.0	39439	0	0	0	0.2	0.4					29.1	28	8	CL
T3	13.0	39440	0	0	0	0	0.4					29.4	27	6	CL-ML
T4	3.0	39441	0	0	0	0.5	1.2					41.2	25	4	ML
T4	5.0	39443	0	0	0	0	1.3	1.4	3.9	10.3	27.3	44.9	—	—	ML
T4	10.0	39445	0	0.6	0.9	2.0	3.7					53.2	23	2	SM
T4	15.0	39446	0	0	0	0	1.2	4.4	7.8	12.5	21.5	34.1	28	4	ML
T4	19.5	39447	2.6	2.6	2.9	4.0	5.8					60.3	—	—	SM

Boring No.	Depth (F)	Serial No.	1-1/2"	1"	3/4"	3/8"	Sieve #4	Size #10	#16	#40	#100	#200	LL	PI	USCS
T6	2.0	39408	0	1.0	2.0	3.7	5.4					34.4	—	—	ML
T6	3.0	39406	12.9	21.1	27.0	40.4	54.0	63.3	69.8	80.2	90.6	93.8			GW-GM
T6	6.0	39409	0	0	0	1.5	6.1	7.8	20.8	54.0	72.2	78.0			SM
T7	1.0	39448	0	4.6	5.8	7.7	9.7					46.3	36	14	CL
T7	5.5	39450	5.6	10.2	14.6	31.1	50.2	63.6	71.2	77.9	82.9	85.4			GM
T7	12.0	39451	32.3	50.7	54.5	67.9	80.2	83.2	85.6	88.0	90.4	92.1			GP-GM
T7	15.0	39452	8.7	12.9	17.6	29.3	39.5	45.7	51.7	62.4	75.7	81.3			SM
T7	19.0	39453	0	1.1	3.0	5.9	8.2					42.1	33	7	ML
T8	0.[illegible]	39410	0	0	0	0.3	0.4					31.4	30	9	CL
T8	4.5	39412	18.8	22.0	24.1	28.2	32.6	36.0	39.5	48.0	66.0	77.4			SM
T8	8.0	39413	11.8	17.5	22.9	34.0	46.1	52.1	59.4	71.3	81.9	85.9			GM
T12	5.0	39455	12.9	20.5	27.2	43.0	57.9	60.5	62.7	66.6	74.1	79.3			GM
T12	9.5	39458	0.6	0.8	1.1	2.2	3.2	4.0	5.3	12.9	38.5	54.3	—	—	SM
T12	18.0	39460	9.8	17.0	21.8	33.2	43.7	49.3	55.0	66.9	80.6	85.3			GM
T13	3.0	39414	0	0	0.6	2.5	6.9	20.7	29.2	40.6	76.0	84.8	27	4	SM
T13	5.0	39416	1.6	2.5	3.3	6.4	10.7	12.9	16.2	16.9	33.7	47.5			ML
T13	6.0	39417	1.5	3.8	4.2	5.3	6.4	8.8	11.6	18.2	38.7	55.7	—	—	SM
T13	9.0	39419	5.2	12.5	18.0	32.8	36.5	43.5	47.8	53.5	63.3	71.2			GM
T13	14.0	39419A	0	0.6	1.3	3.0	4.9	6.7	8.7	14.7	37.0	57.8			SM

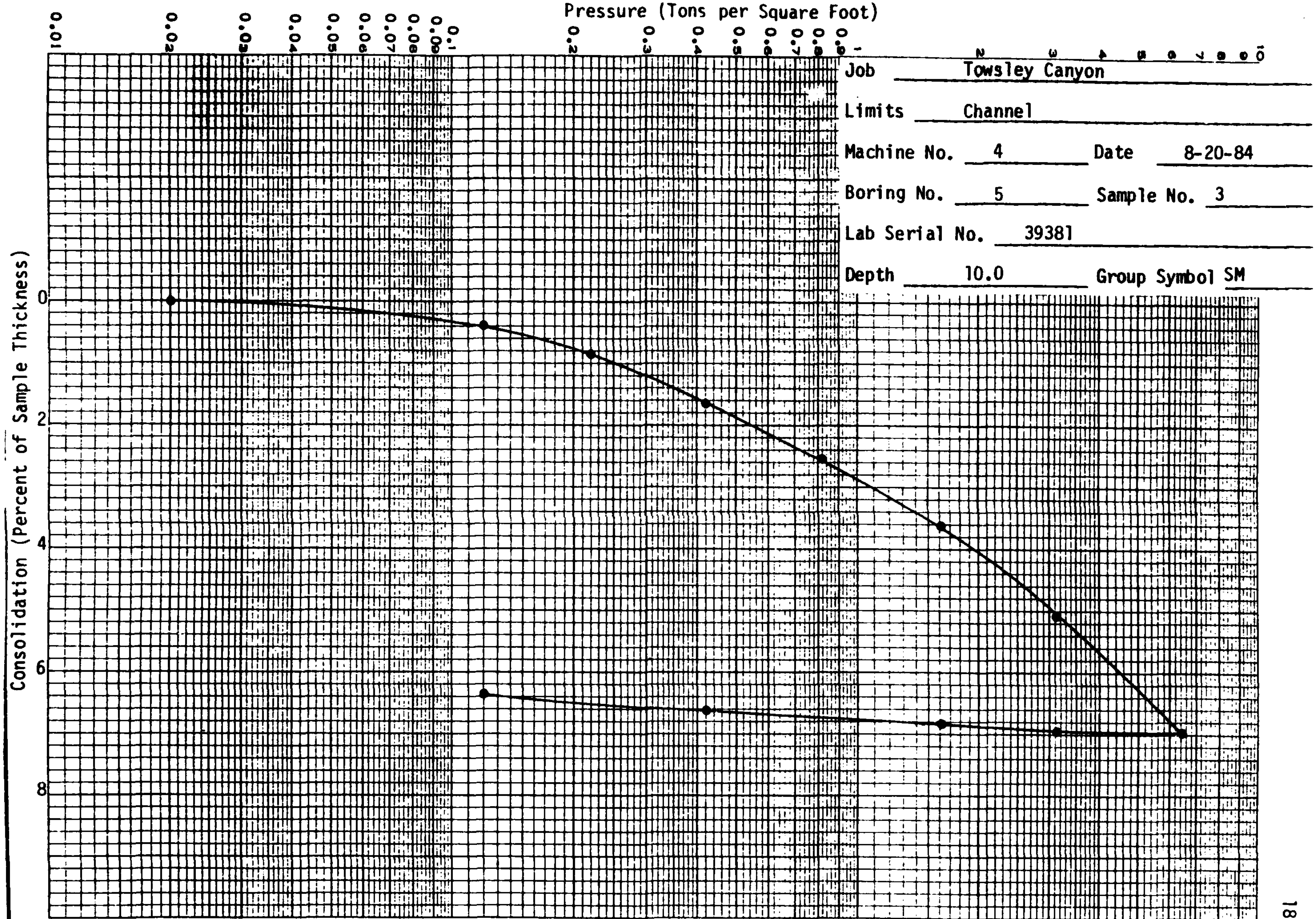
Boring No.	Depth (F)	Serial No.	Sieve Size 1-1/2"	1"	3/4"	3/8"	#4	#10	#16	#40	#100	#200	LL	PI	USCS
T14	1.5	39420	0	0	0	0.9	1.9					27.0	29	6	ML
T14	4.0	39421	1.7	4.9	9.3	20.2	30.8	42.8	51.1	59.2	65.7	70.8			SM
T14	6.0	39422	0	0	1.1	4.3	11.5	33.7	58.6	77.5	85.4	88.3			SP-SM
T14	9.0	39424	8.3	18.7	28.3	48.8	62.0	67.4	72.9	82.3	90.3	93.0			GW-GM
T14	11.0	39425	17.0	24.2	30.4	42.7	51.7	58.8	69.2	80.4	88.2	90.9			GW-GM
T14	14.0	39426	13.1	20.3	25.5	37.1	51.0	58.1	67.7	80.7	89.4	92.0			GP-GM
T15	3.5	39428	5.2	11.1	16.9	27.5	38.3	45.3	54.2	68.1	81.7	88.7			SP-SM
T16	4.0	39430	14.5	23.5	28.1	40.3	55.8	65.9	75.9	86.2	92.2	94.5			GW-GM
T16	6.5	39431	0	0	0	0	0					8.8	36	10	ML

*Indicates values which have been linearly interpolated between adjacent values. This was necessary because the sieve nests were not the ones required.

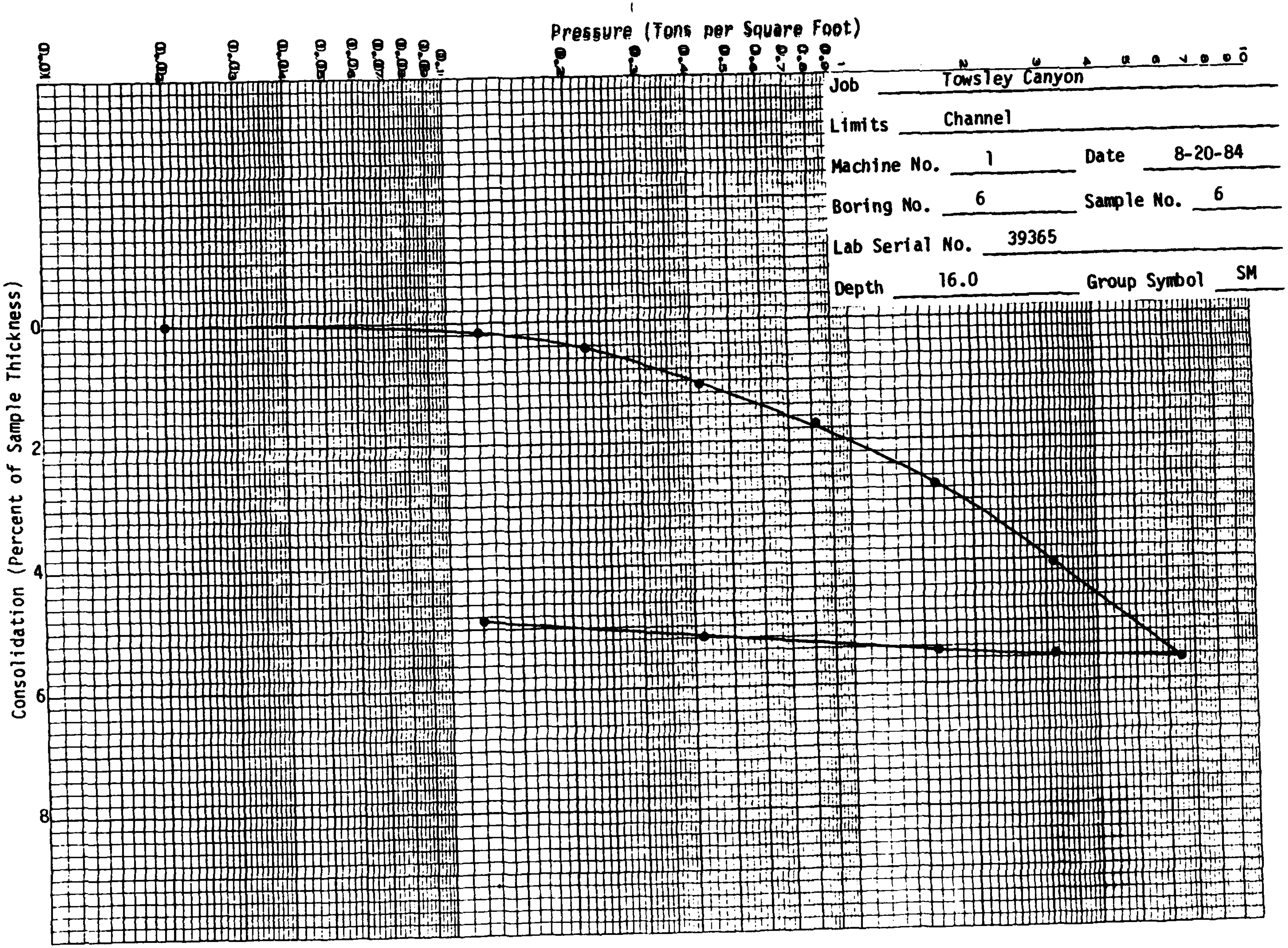
—Indicates an Atterberg Limits test which could not be completed due to a lack of cohesion.



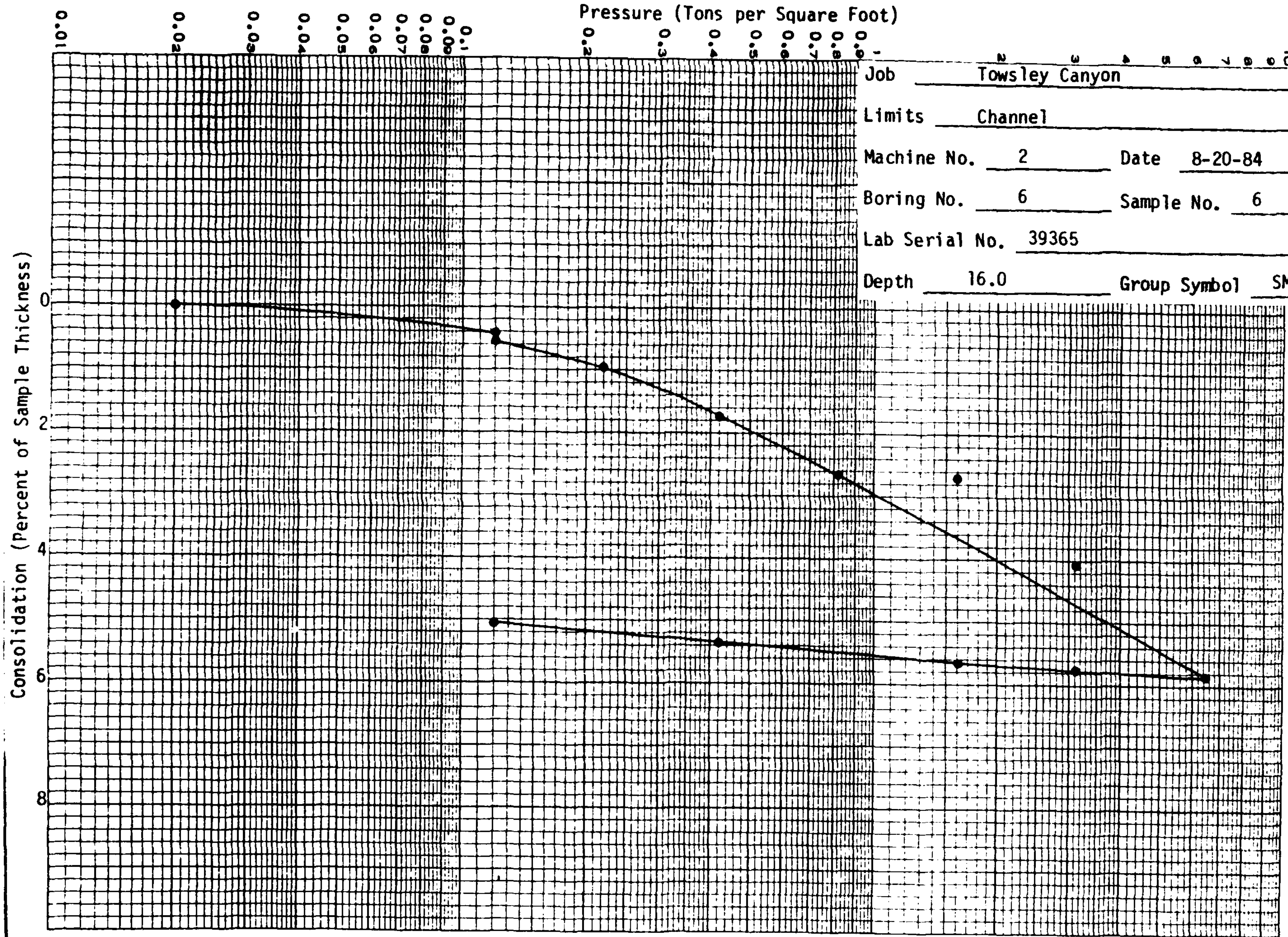
Water added at 0.12 tons per square foot pressure.



Water added at 0.12 tons per square foot pressure.



Water added at 0.12 tons per square foot pressure.



Job Towsley Canyon

Limits Channel

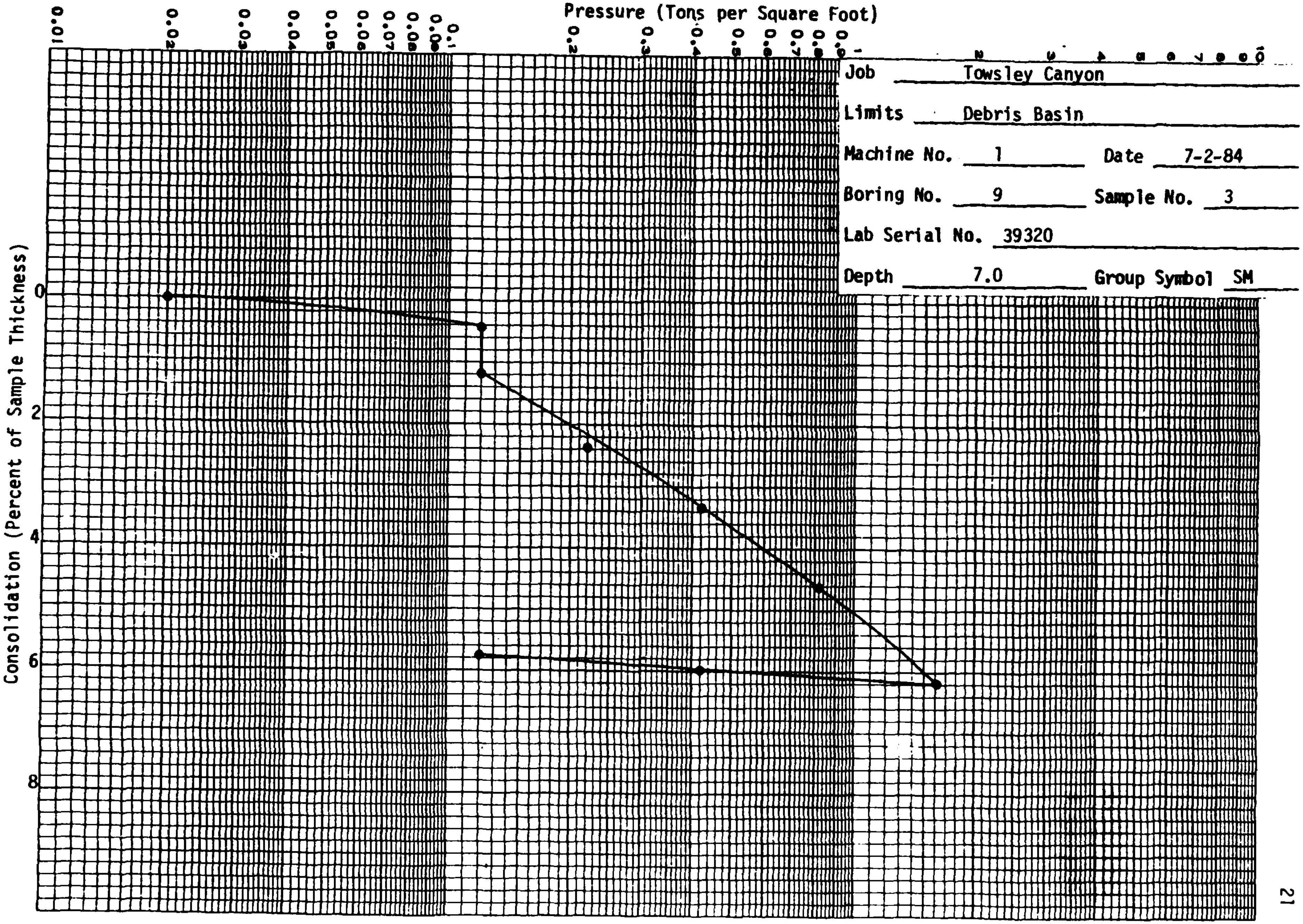
Machine No. 2 Date 8-20-84

Boring No. 6 Sample No. 6

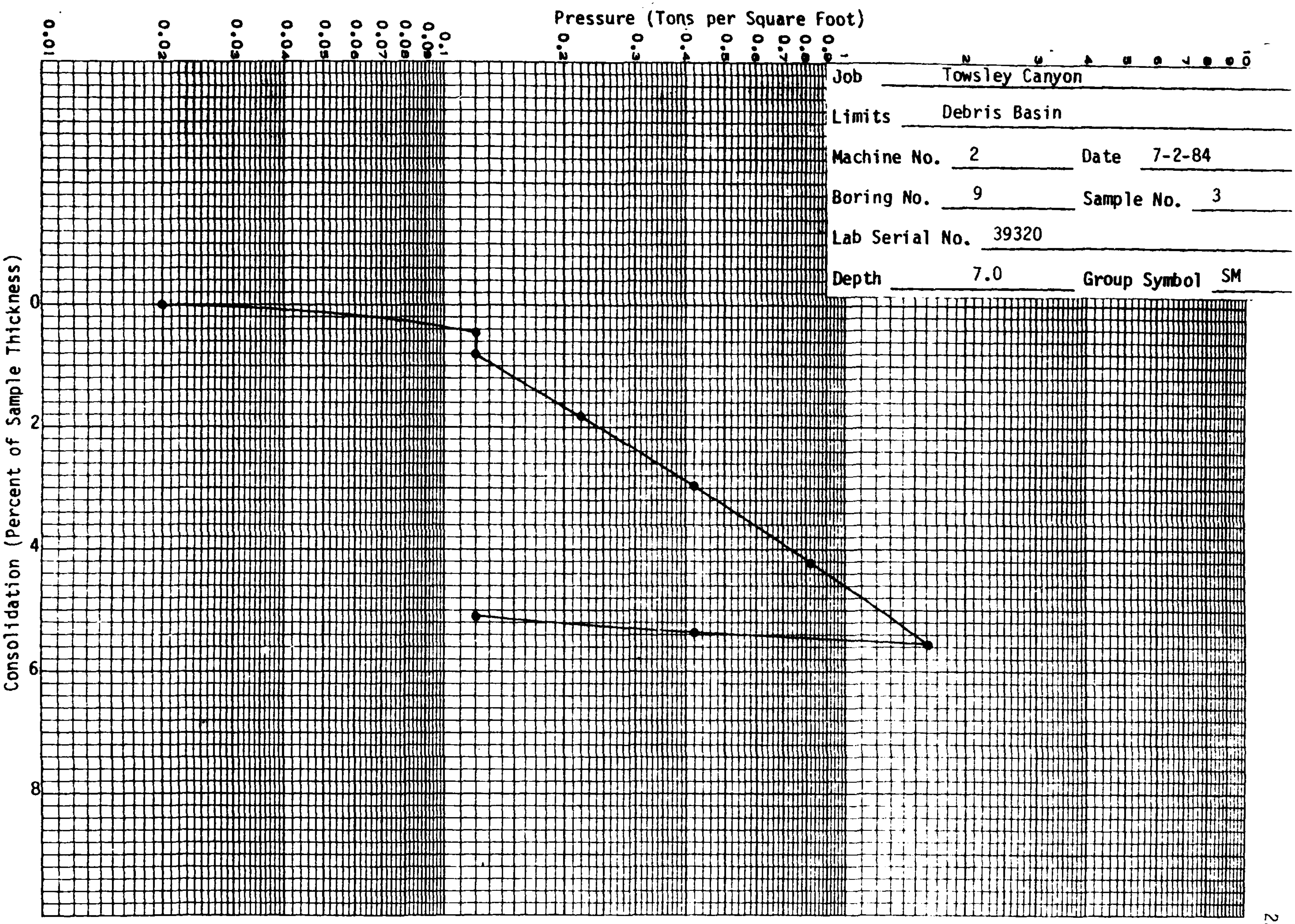
Lab Serial No. 39365

Depth 16.0 Group Symbol SM

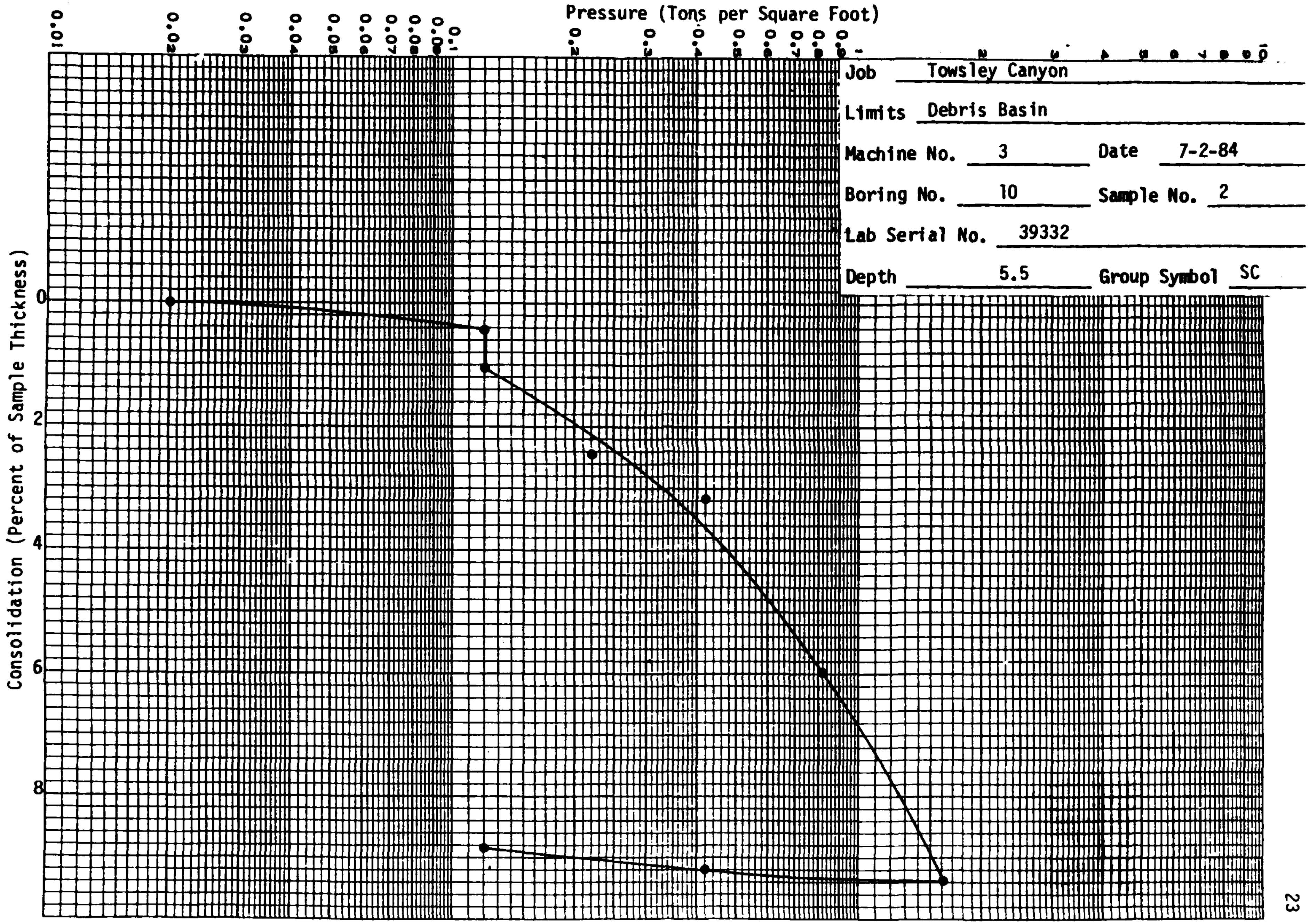
Water added at 0.12 tons per square foot pressure.



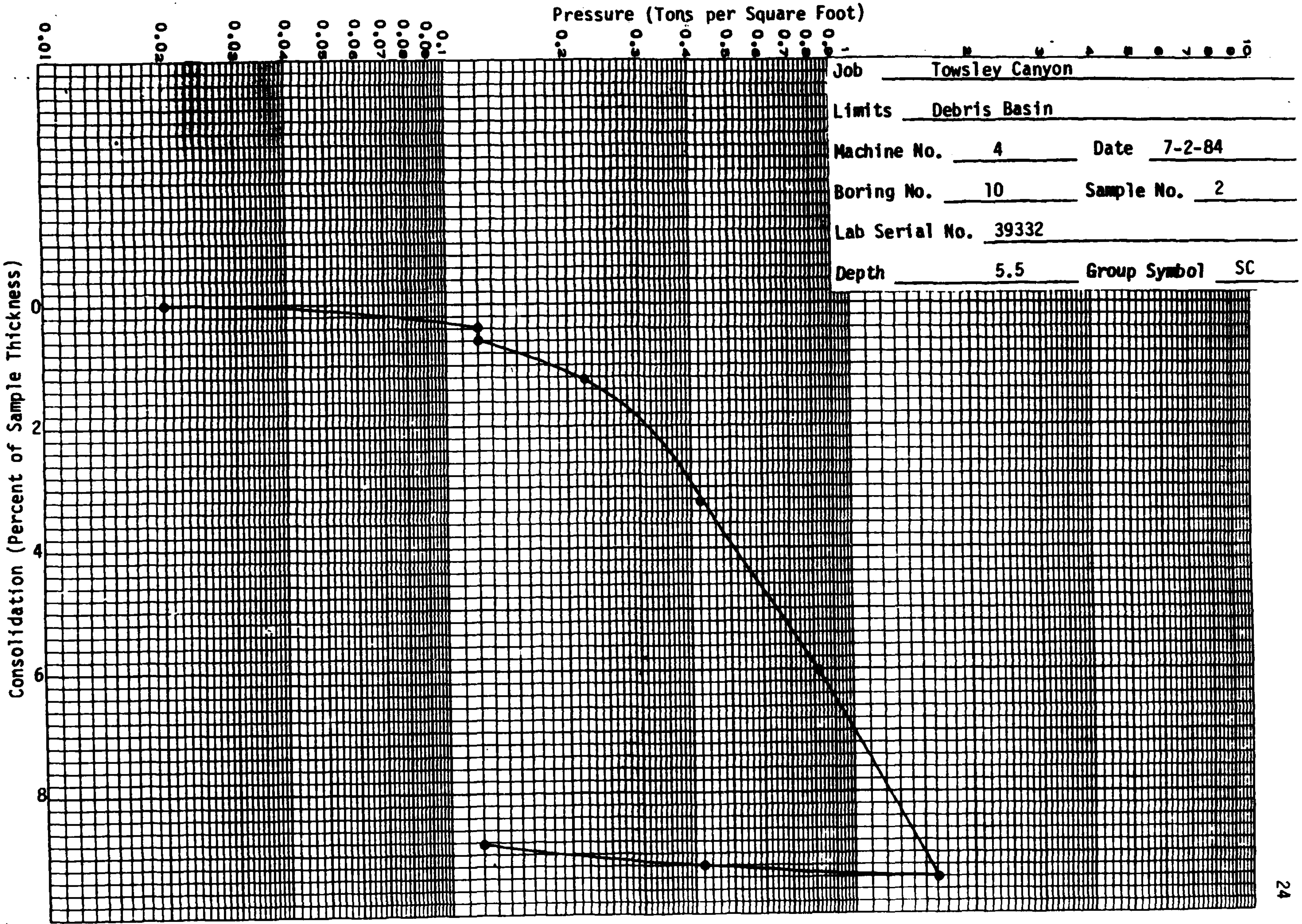
Water added at 0.12 tons per square foot pressure.



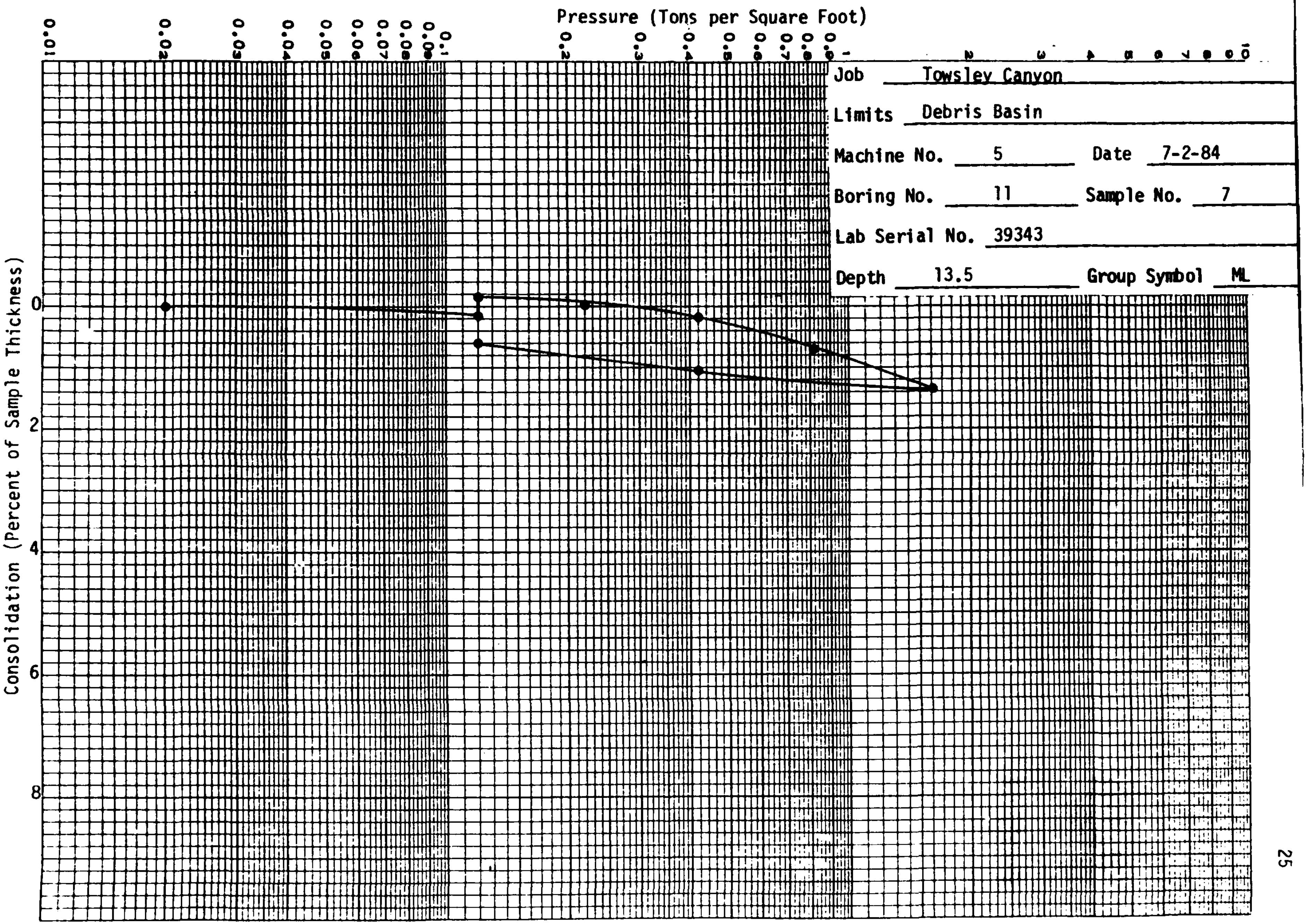
Water added at 0.12 tons per square foot pressure.



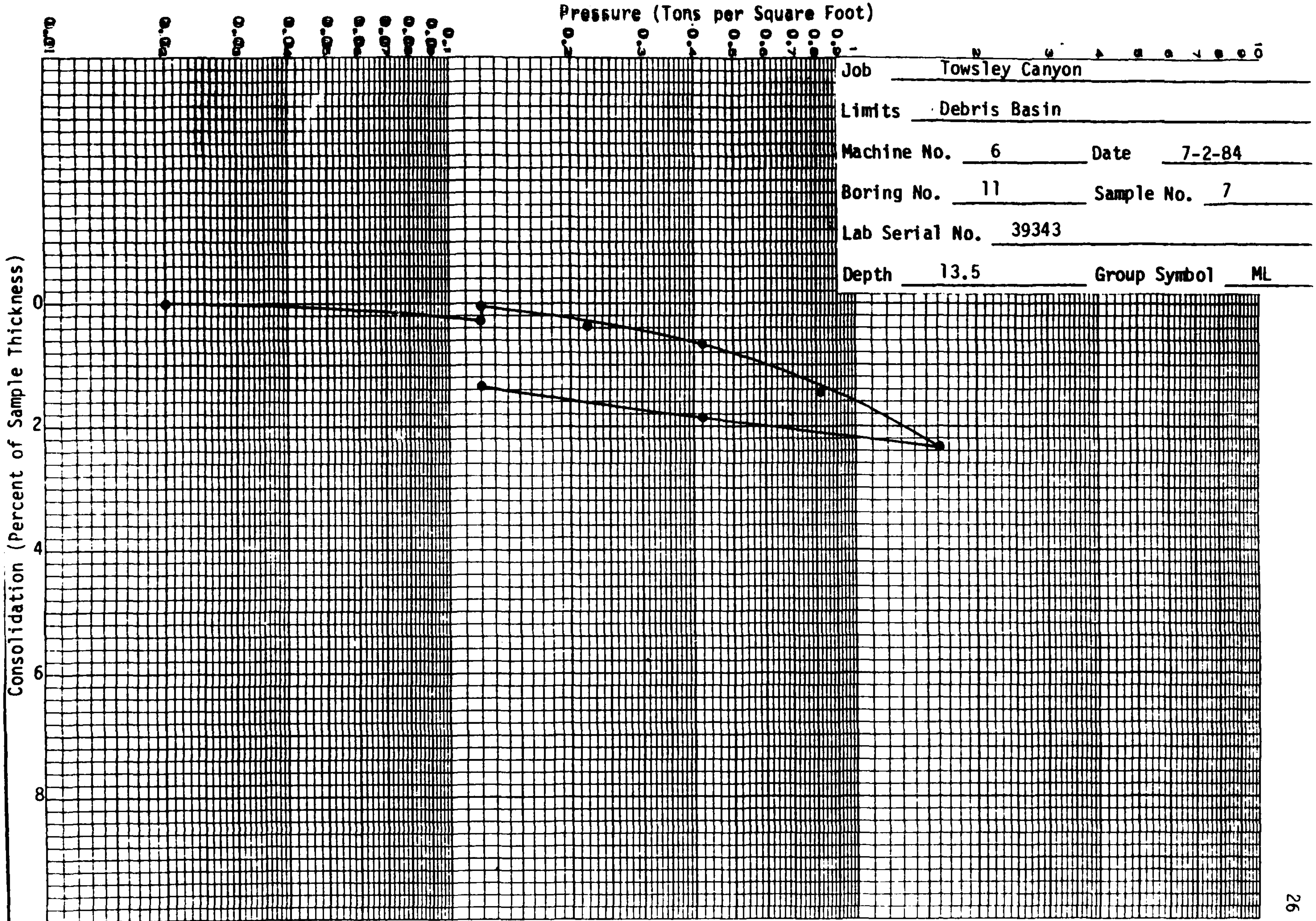
Water added at 0.12 tons per square foot pressure.



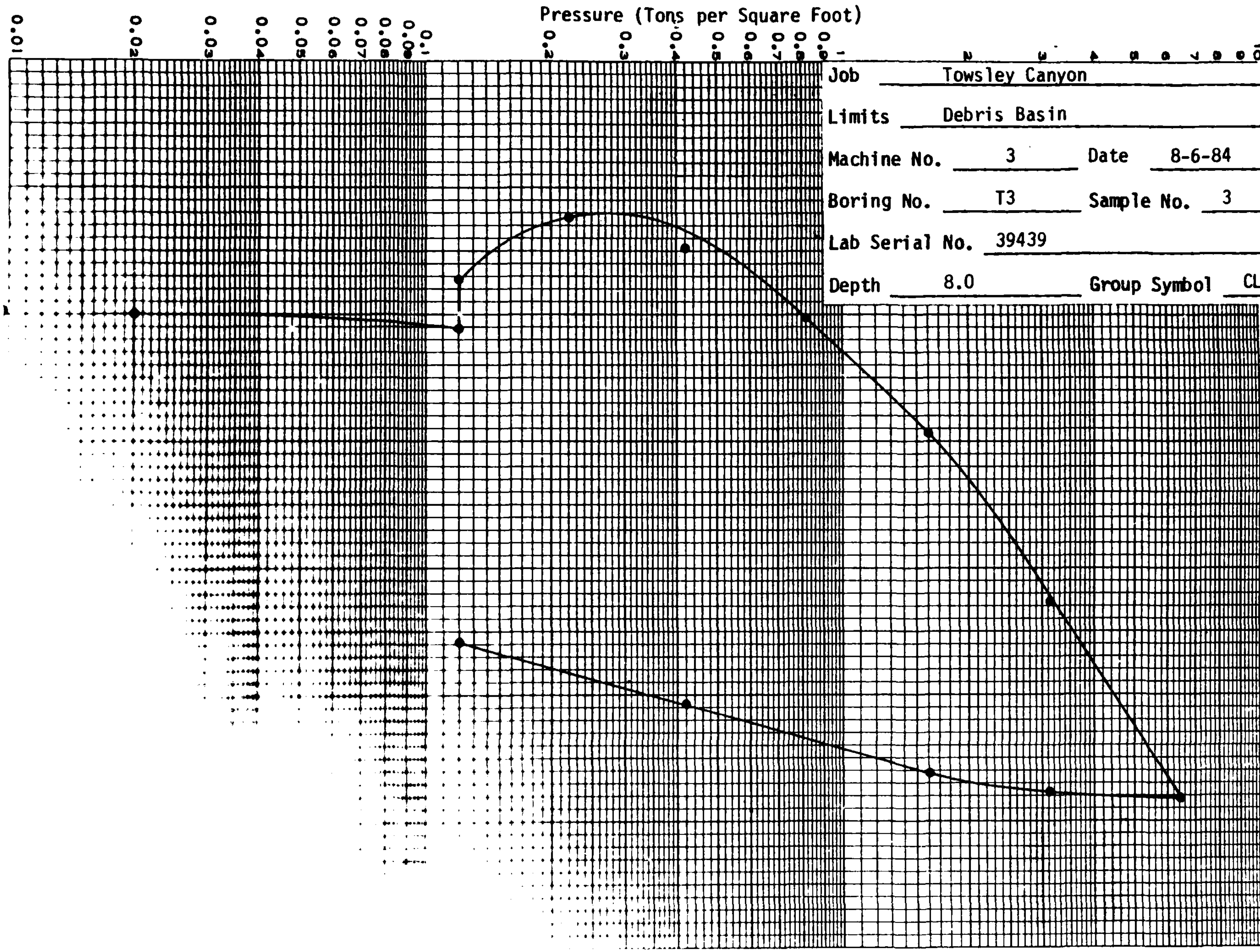
Water added at 0.12 tons per square foot pressure.



Water added at 0.12 tons per square foot pressure.



Water added at 0.12 tons per square foot pressure.



Job: Towsley Canyon

Limits: Debris Basin

Machine No.: 3 Date: 8-6-84

Boring No.: T3 Sample No.: 3

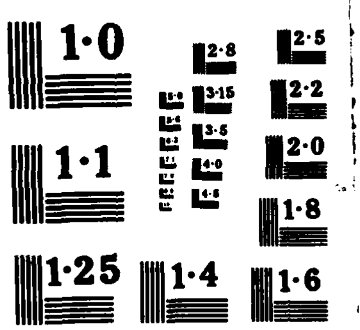
Lab Serial No.: 39439

Depth: 8.0 Group Symbol: CL

Note: Remolded to 90% R.C.

AD-A186 575 SOUTH FORK OF THE SANTA CLARA RIVER SANTA CLARITA VALLEY CALIFORNIA SUPPLEMENT(U) ARMY ENGINEER DISTRICT LOS ANGELES CA JAN 85 3/4

UNCLASSIFIED F/G 13/2 NL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2·5
3·15
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4·0
1·1
1·8
1·25
1·4
1·6

Job Towsley Canyon

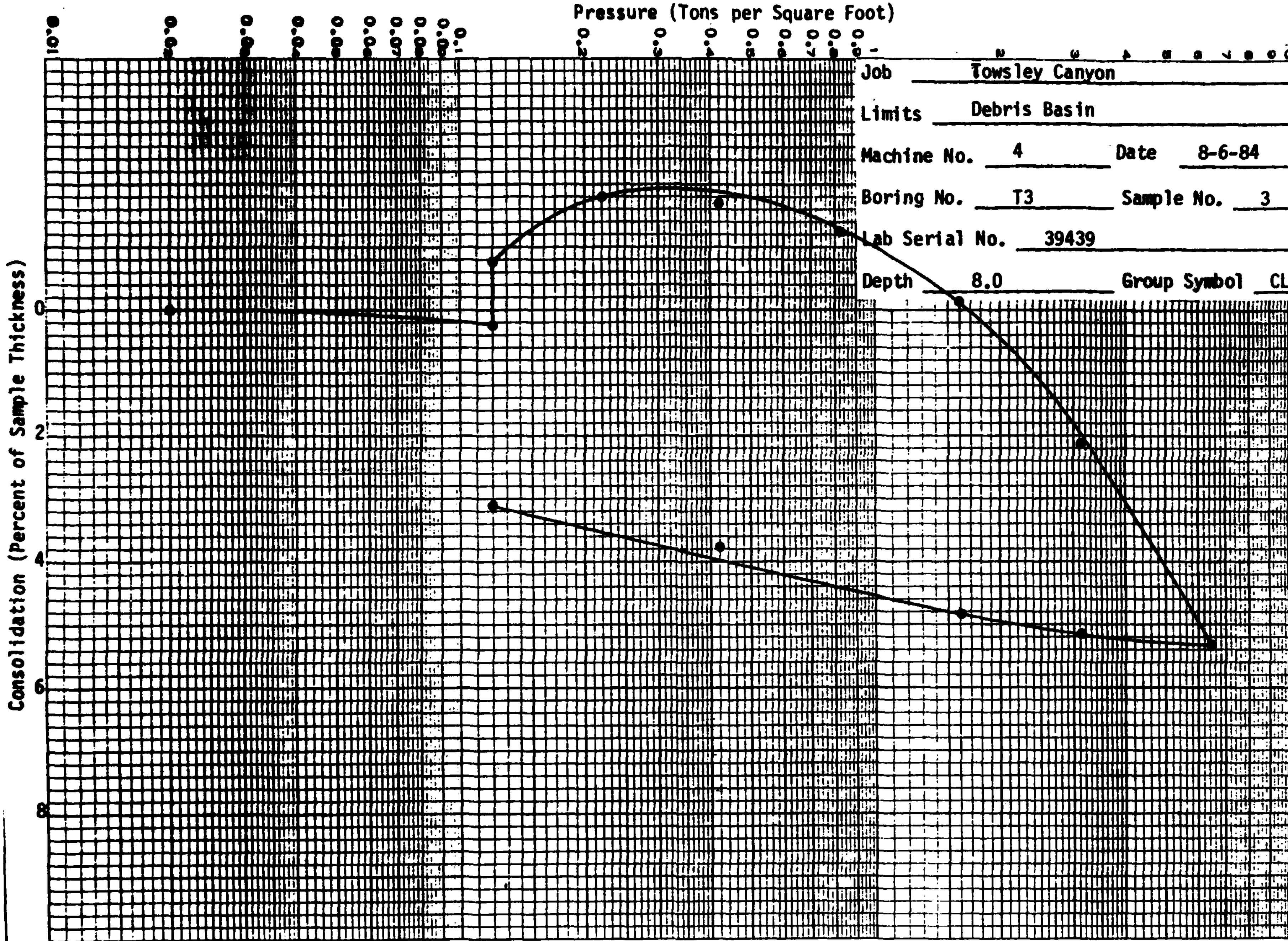
Limits Debris Basin

Machine No. 4 Date 8-6-84

Boring No. T3 Sample No. 3

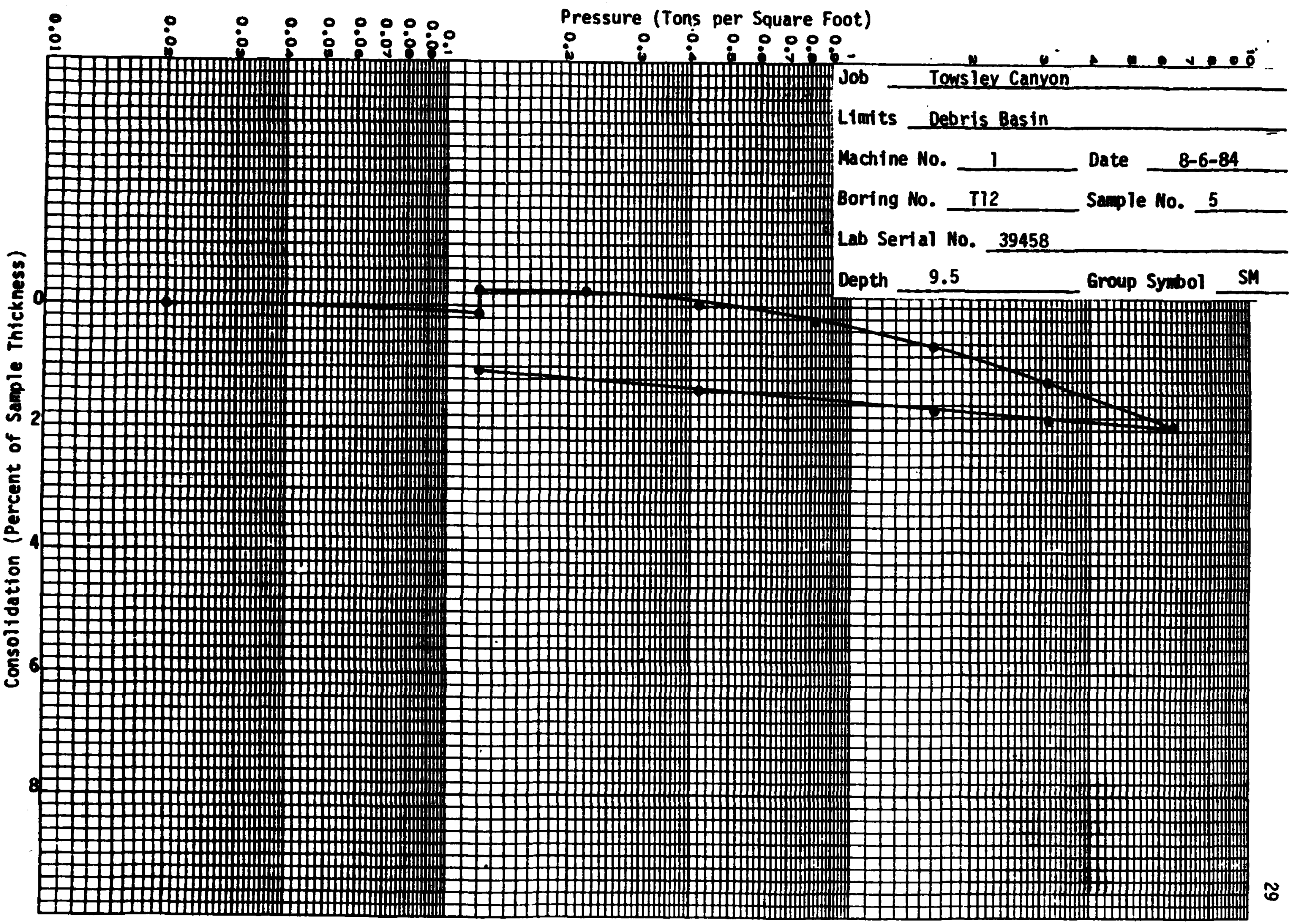
Lab Serial No. 39439

Depth 8.0 Group Symbol CL



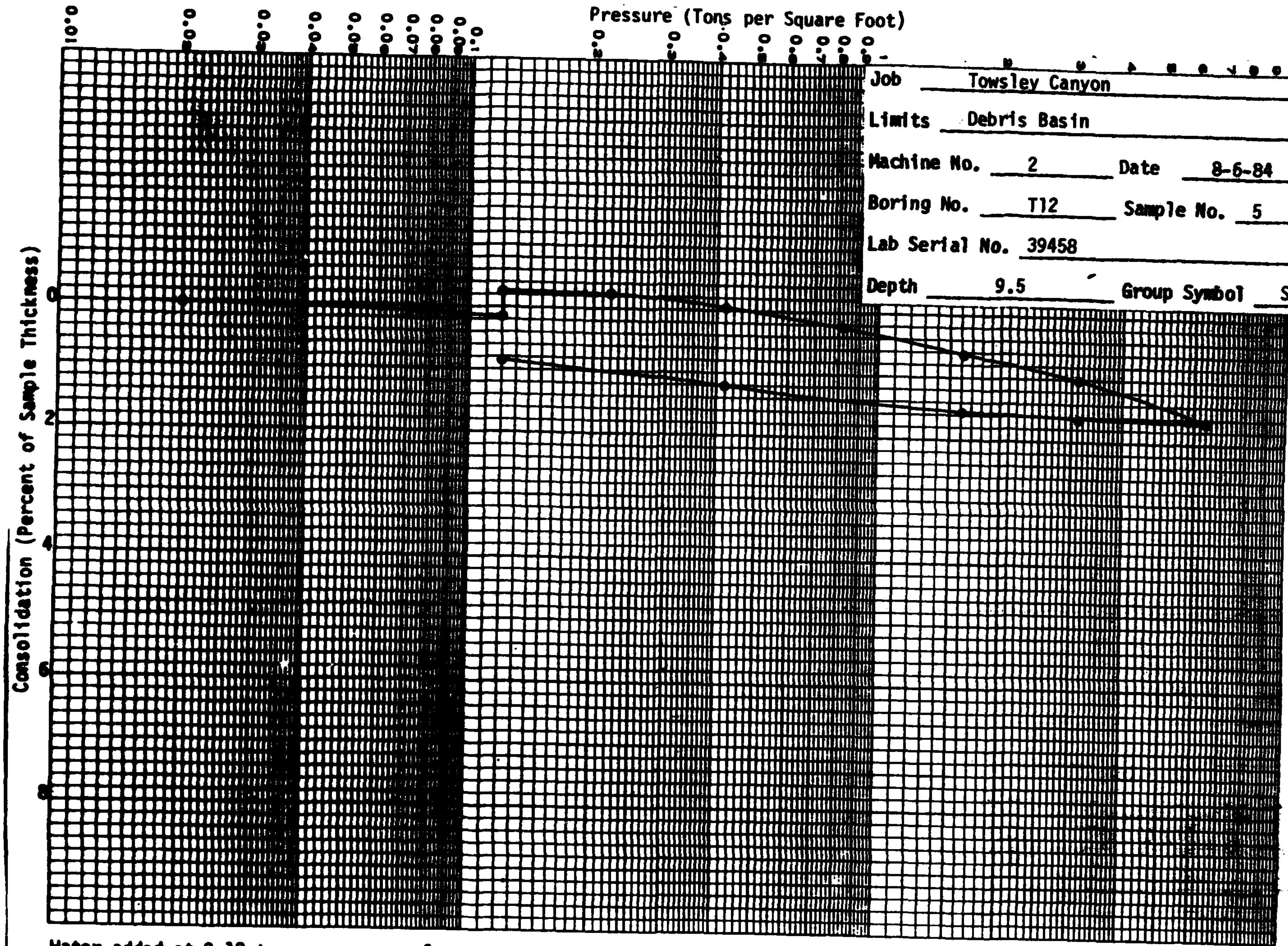
Water added at 0.12 tons per square foot pressure.

Note: Remolded to 90% R.C.



Water added at 0.12 tons per square foot pressure.

Note: Remolded to 90% R.C.



Job Towsley Canyon

Limits Debris Basin

Machine No. 2 Date 8-6-84

Boring No. T12 Sample No. 5

Lab Serial No. 39458

Depth 9.5' Group Symbol SM

Water added at 0.12 tons per square foot pressure.

Note: Remolded to 90% R.C.

Job Towsley Canyon

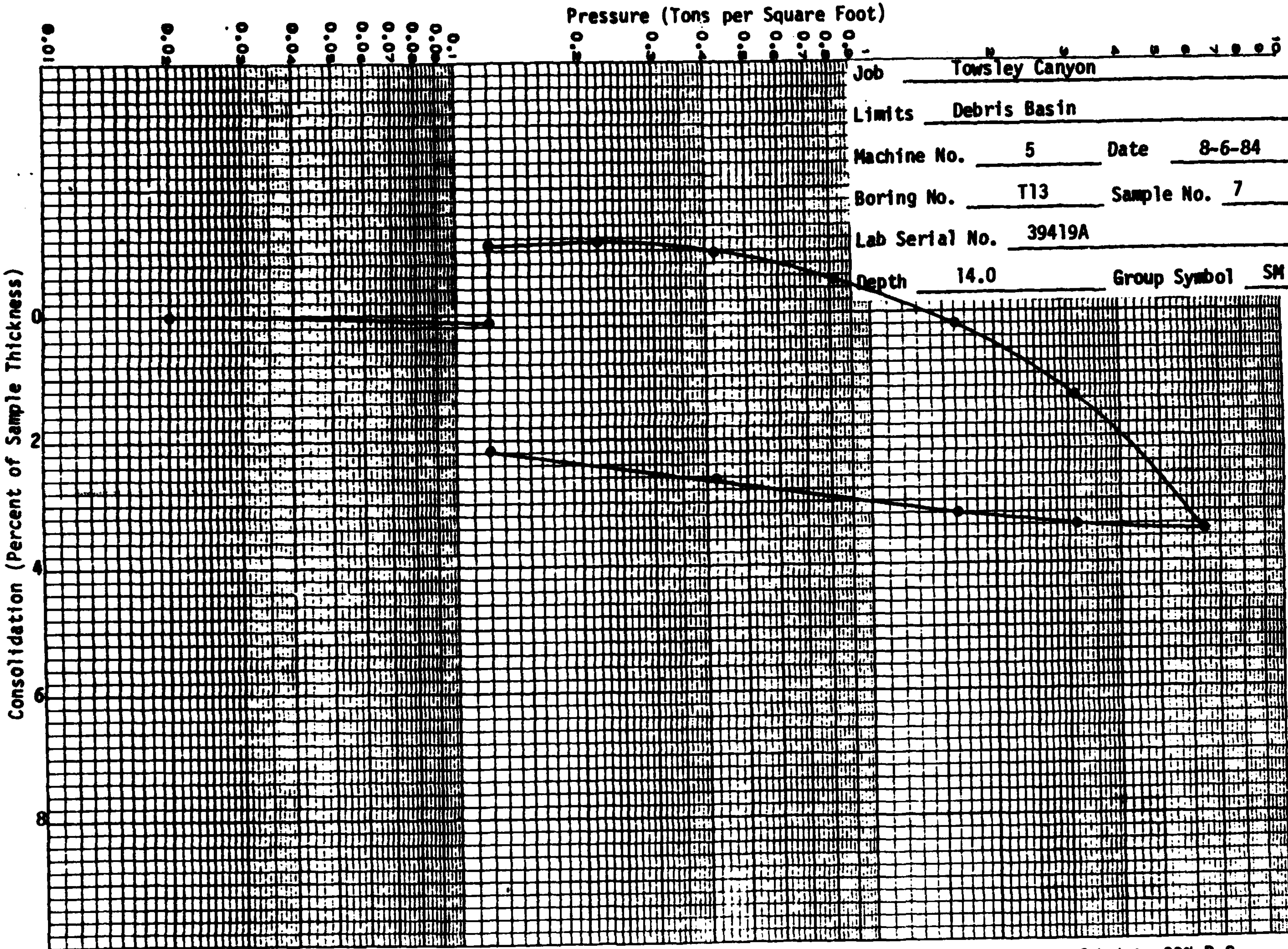
Limits Debris Basin

Machine No. 5 Date 8-6-84

Boring No. T13 Sample No. 7

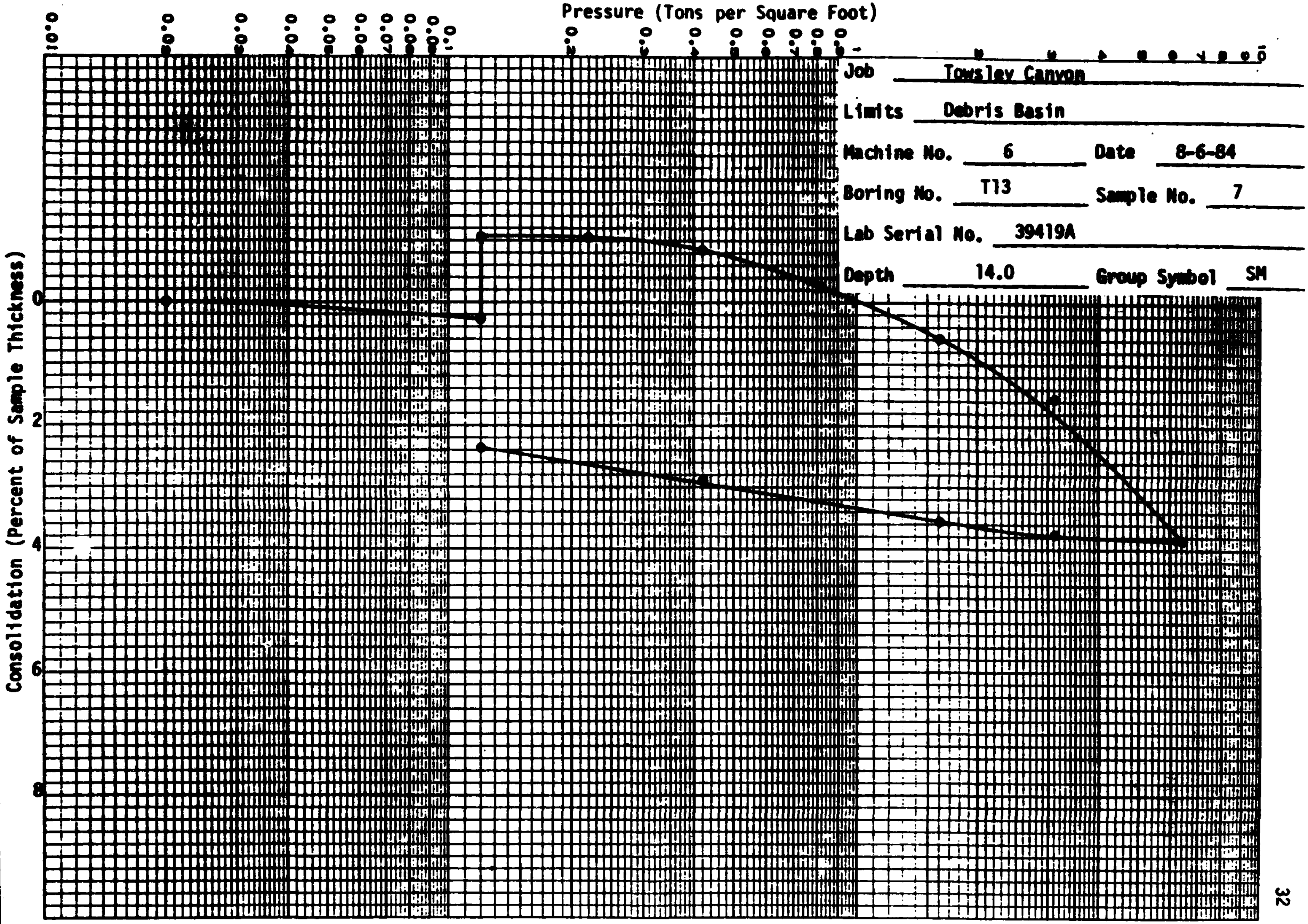
Lab Serial No. 39419A

Depth 14.0 Group Symbol SM



Water added at 0.12 tons per square foot pressure.

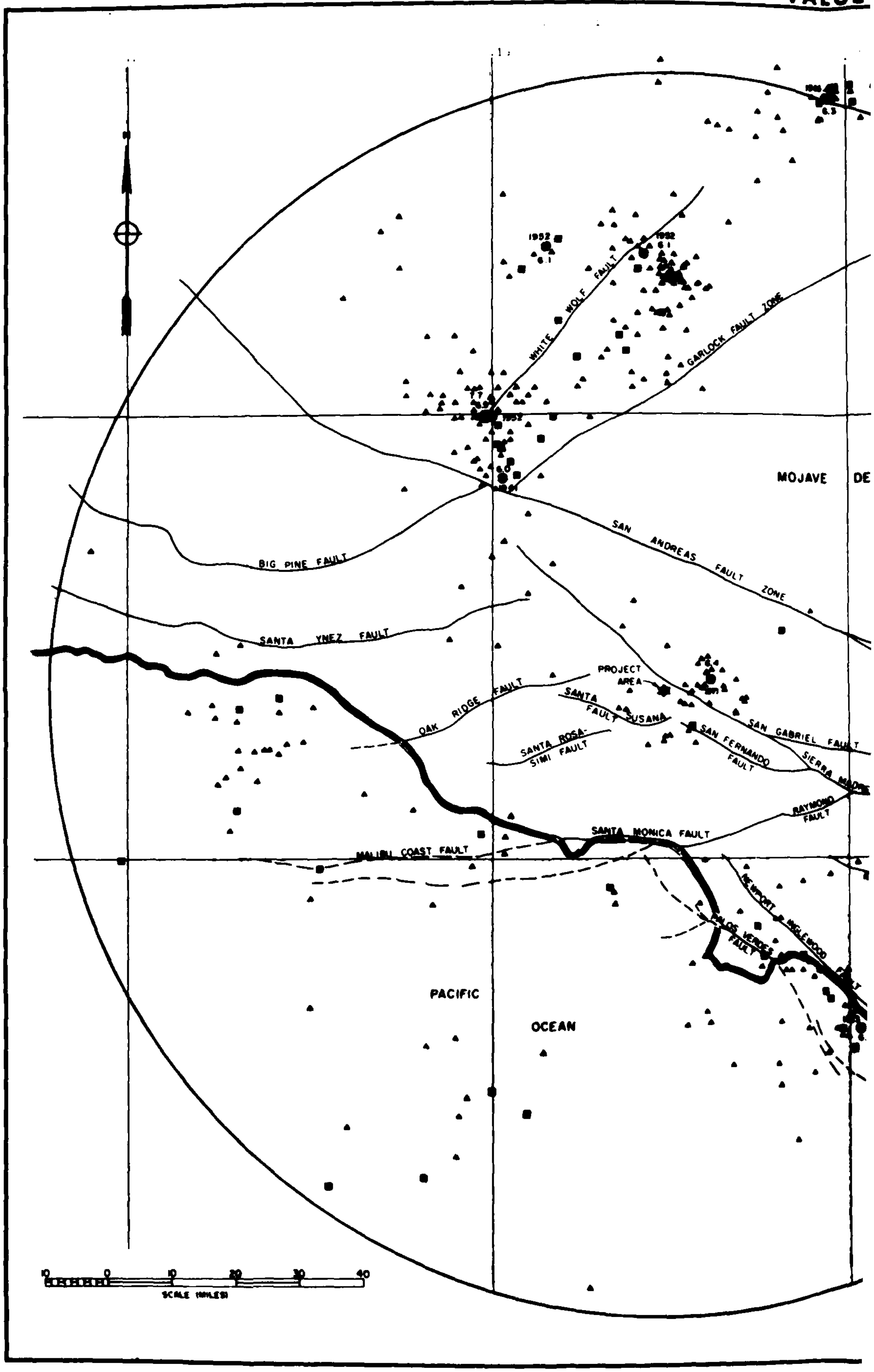
Note: Remolded to 90% R.C.



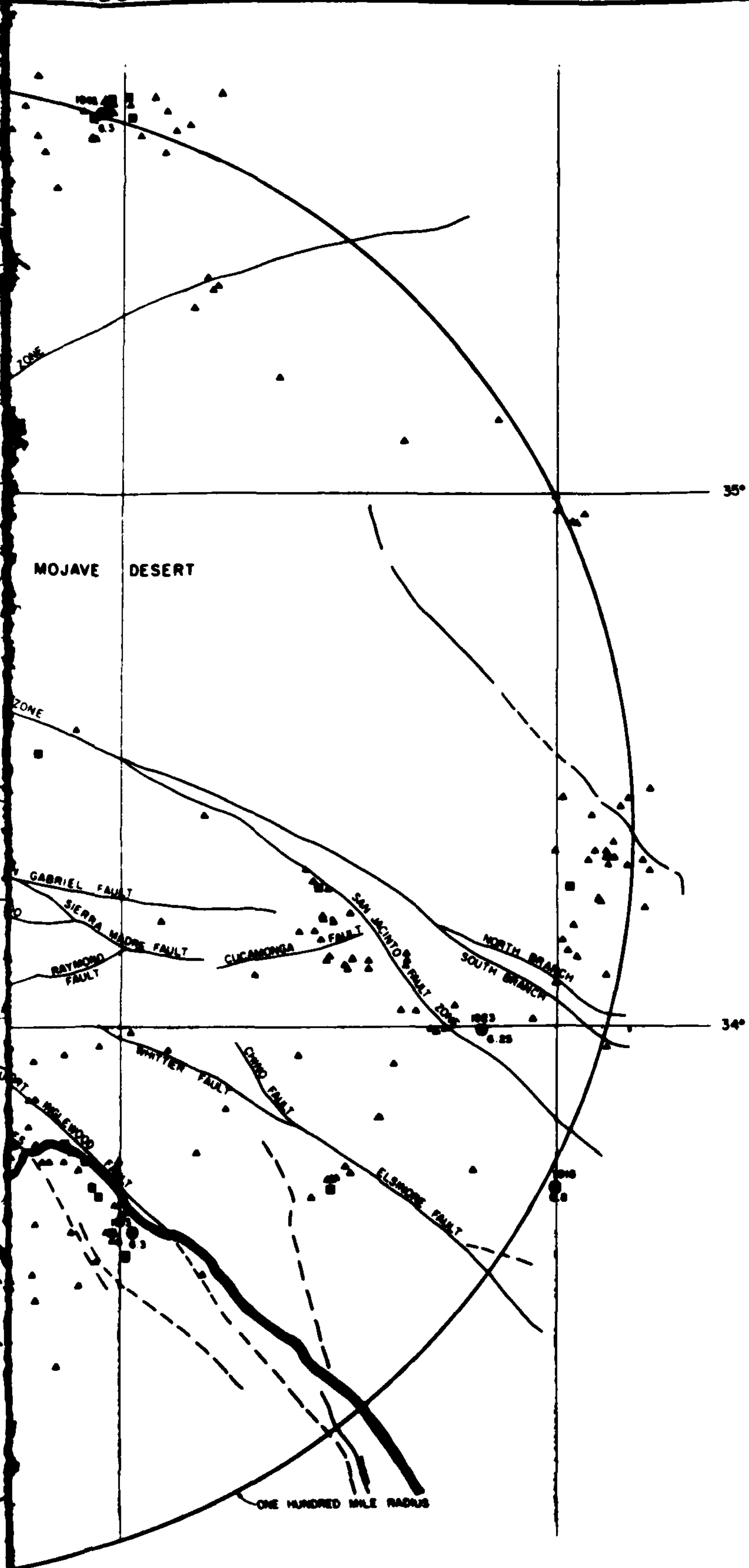
Water added at 0.12 tons per square foot pressure.

Note: Remolded to 90% R.C.

VALUE


1952
1952
6.1
WHITE WOLF FAULT
GARLOCK FAULT ZONE
MOJAVE DE
SAN ANDREAS FAULT ZONE
BIG PINE FAULT
SANTA YNEZ FAULT
PROJECT AREA
OAK RIDGE FAULT
SANTA SUSANA FAULT
SANTA ROSA-SIMI FAULT
SAN GABRIEL FAULT
SAN FERNANDO FAULT
SIERRA MADRE
RAYMOND FAULT
SANTA MONICA FAULT
MALIBU COAST FAULT
NEWPORT - INGLEWOOD FAULT
PALOS VERDES FAULT
PACIFIC
OCEAN
10 0 10 20 30 40
SCALE (MILES)

VALUE ENGINEERING PAYS



LEGEND

- ▲ EARTHQUAKE WITH MAGNITUDE 4.0 THRU 4.99
- ■ EARTHQUAKE WITH MAGNITUDE 5.0 THRU 5.99
- ● EARTHQUAKE WITH MAGNITUDE 6.0 THRU 6.99
- ● EARTHQUAKE WITH MAGNITUDE 7.0 +
- LOCATION OF PROJECT AREA

TRACE OF FAULT - DASHED WHERE INFERRED OR CONCEALED

NOTES:

1. RICHTER SCALE MAGNITUDES ARE A MEASURE OF THE ENERGY RELEASED AT THE FOCUS (CENTER OF THE EARTHQUAKE) AS DETERMINED BY THE AMPLITUDES PRODUCED ON A SEISMOGRAM
2. THE EPICENTER, DENOTED BY THE MAGNITUDE SYMBOL, IS THE POINT ON THE EARTH'S SURFACE DIRECTLY ABOVE THE FOCUS
3. EARTHQUAKE EPICENTERS PLOTTED ARE FROM 1932 TO 1984 UNLESS OTHER DATES ARE SHOWN.

SOUTH FORK SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA

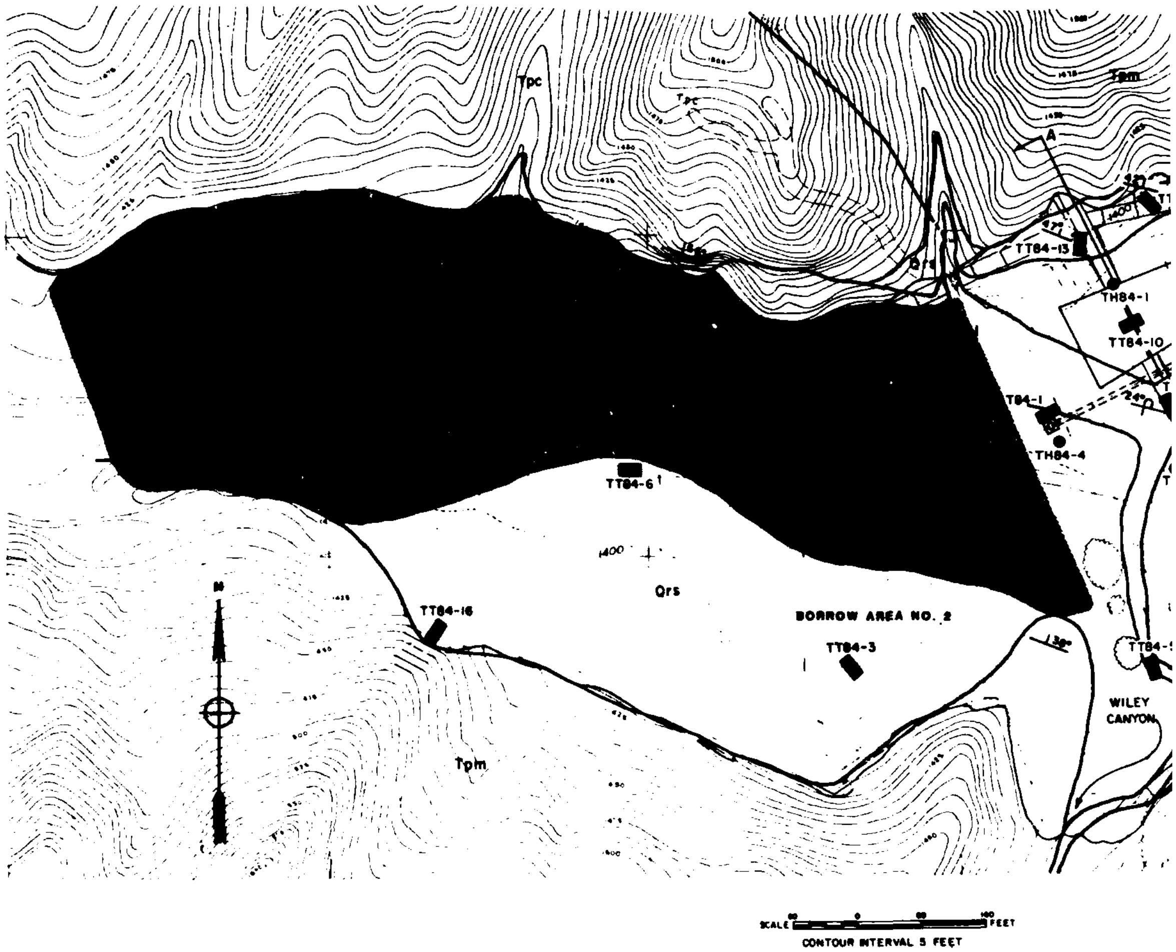
SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

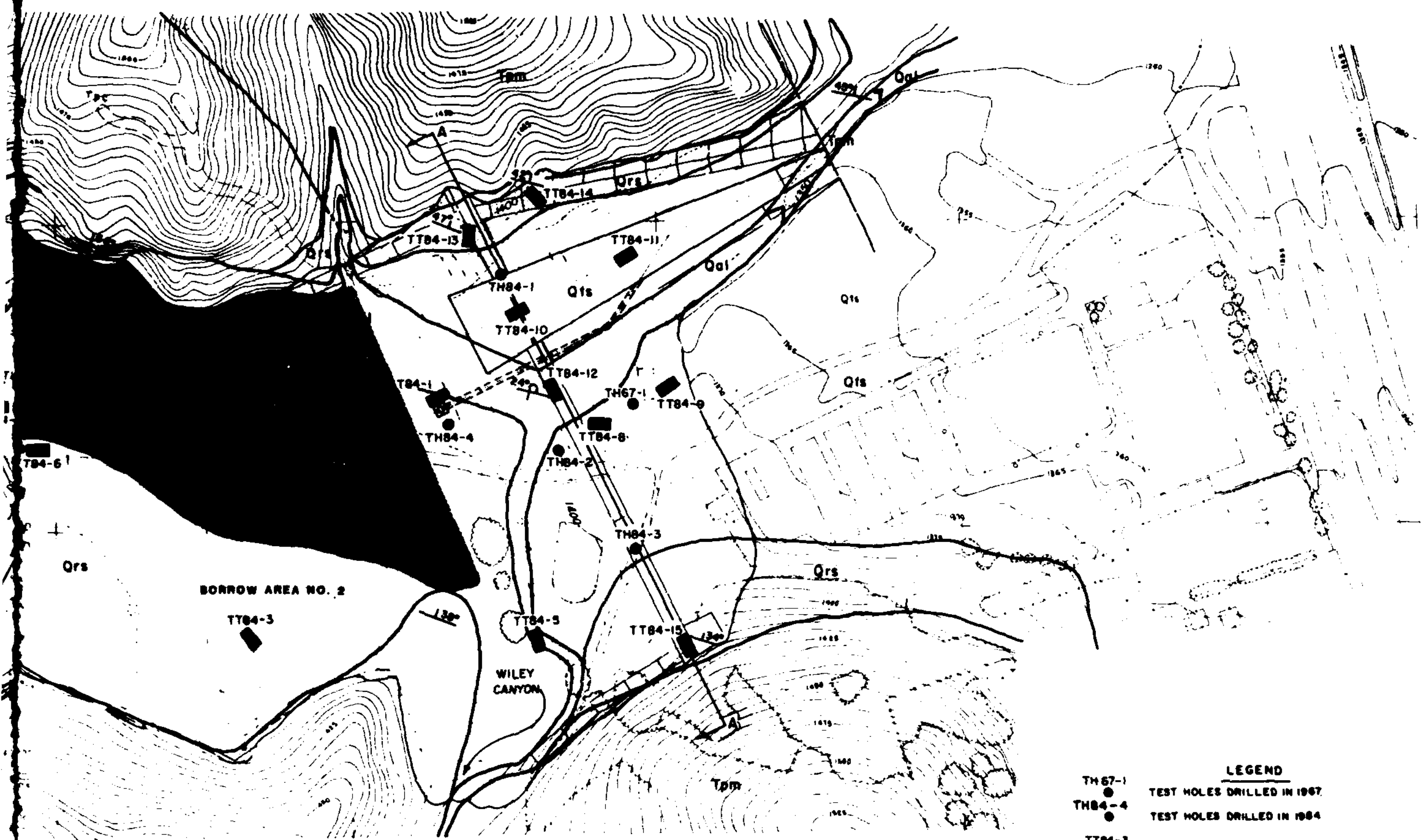
LOCATIONS OF FAULTS AND
EARTHQUAKE EPICENTERS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

SAFETY PAYS

PLATE C-1


Tpc
Tpm
TT84-13
TH84-1
TT84-10
TH84-4
TT84-6
Qrs
BORROW AREA NO. 2
TT84-3
TT84-16
WILEY
CANYON
SCALE
FEET
CONTOUR INTERVAL 5 FEET



SCALE 50 0 50 100 FEET

CONTOUR INTERVAL 5 FEET

LEGEND

TH67-1 ● TEST HOLES DRILLED IN 1967

TH84-4 ● TEST HOLES DRILLED IN 1984

TT84-3 TEST TRENCH - EXCAVATED BY DOZER OR BACKHOE

STRIKE AND DIP OF INCLINED BEDDING (47°)

STRIKE AND DIP OF OVERTURNED BEDDING (24°)

CONTACT BETWEEN GEOLOGIC FORMATIONS

BORROW AREA NO 1

BORROW AREA NO 2

Qal — QUATERNARY ALLUVIAL SEDIMENTS - HOLOCENE AGE

ALLUVIUM, STREAMBED DEPOSITS IN TOWSLEY CANYON AND WILEY CANYON STREAMBED, SILTY SANDS, GRAVELLY SILTY SANDS, SANDY GRAVELS, WITH COBBLES AND BOULDERS, SUB-ROUNDED TO ROUNDED.

Qts — PLEISTOCENE AGE

TERRACE DEPOSITS; FOUND IN STREAM TERRACES ABOVE THE ACTIVE STREAMBED. SILTS, SANDS AND GRAVELS WITH COBBLES AND BOULDERS SUB-ROUNDED TO ROUNDED.

Qrs

RESIDUAL SOIL: SILT, SAND AND SILTY SAND, TAN, COMPOSED OF HIGHLY WEATHERED, DECOMPOSED BEDROCK AND SEDIMENT WASHED DOWN FROM HIGHER SLOPES.

Tpc — TOWSLEY AND UPPER PICO FORMATION - PLIOCENE AGE

CONGLOMERATE AND SANDSTONE; BROWN AND GRAY. CONGLOMERATE DIPS 60° TO 70° NE

Tpm

MUDSTONE; GRAY TO BROWN, MODERATELY SOFT TO MODERATEY, HARD, WEATHERED AT SURFACE, BUT BECOMING HARDER AND LESS WEATHERED WITH DEPTH OCCASIONAL THIN STREAKS OF FINE SANDSTONES. MUDSTONE DIPS 30° TO 45° NE.
THE MUDSTONE IS GENERALLY COVERED BY AN APPROXIMATE 2 FOOT THICK LAYER OF RESIDUAL SOIL (Qrs)

NOTES:

1. SEE PLATE C-9 FOR GEOLOGIC PROFILE A-A
2. SEE PLATE C-4 FOR SOILS LOGS TH84-1 THRU 4
3. SEE PLATES C-5 AND 6 FOR SOILS LOGS TT84-1 THRU 12
4. SEE PLATE C-7 FOR GEOLOGIC LOGS OF TEST HOLES AND TEST TRENCHES
5. TH84-1 AND 2 ARE CASED OBSERVATION WELLS.

NATIONAL GEODETIC VERTICAL DATUM OF 1929

SOUTH FORK SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA

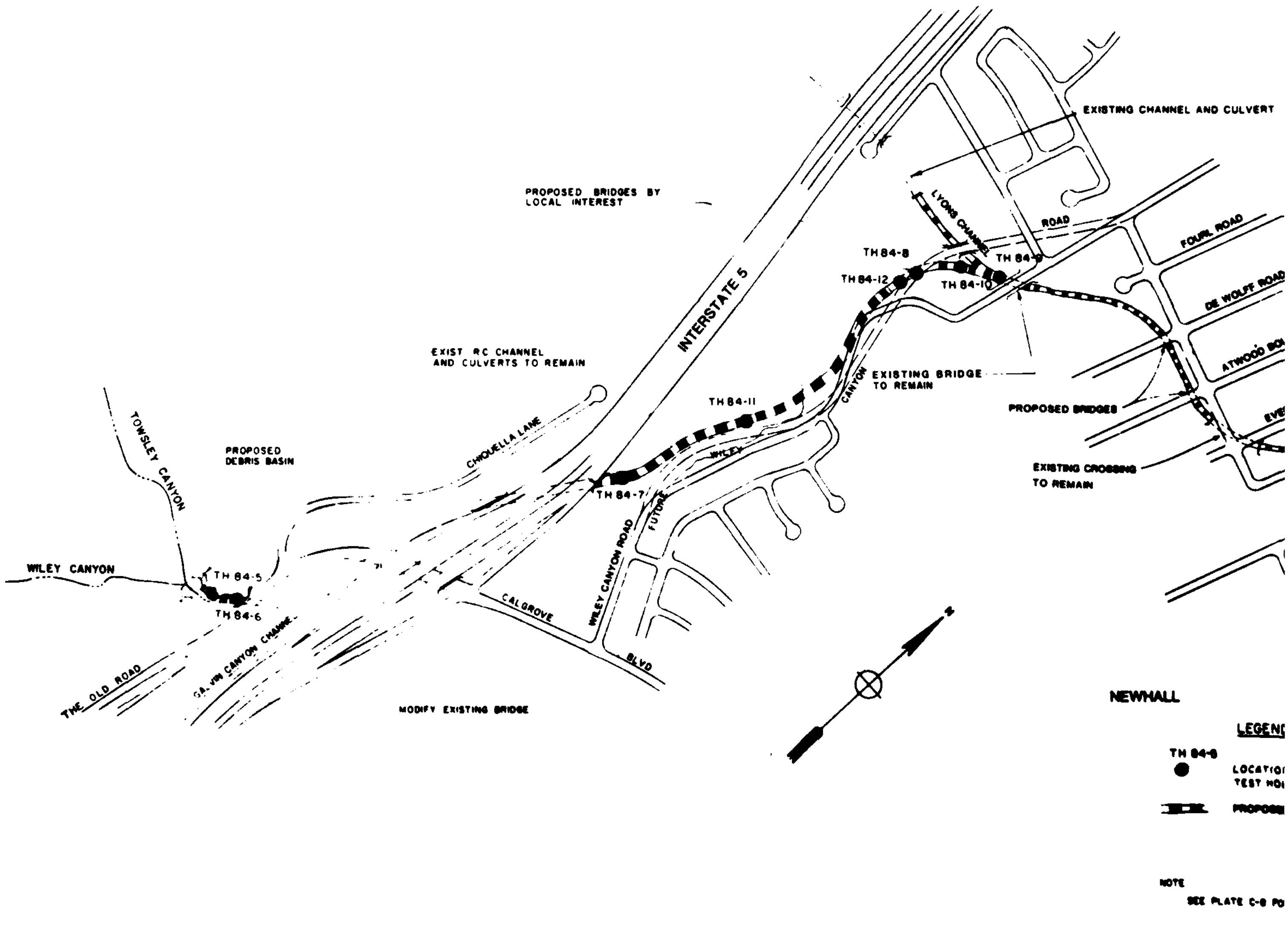
SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

DEBRIS BASIN PLAN OF EXPLORATION
AND GEOLOGIC MAP

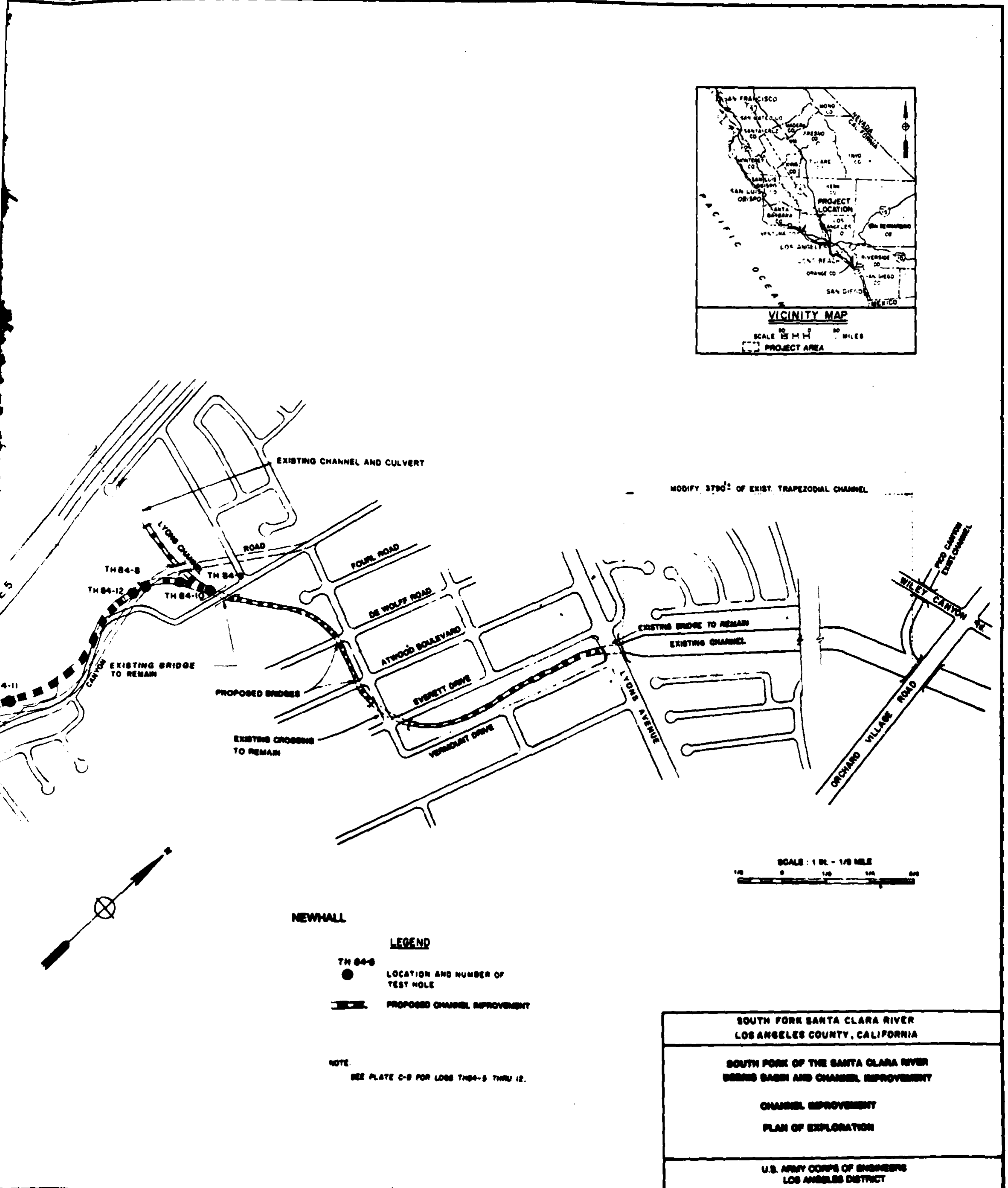
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE C-2

2


EXISTING CHANNEL AND CULVERT
PROPOSED BRIDGES BY LOCAL INTEREST
INTERSTATE 5
LYONS CHANNEL
ROAD
FOURL ROAD
DE WOLFF ROAD
TH 84-8
TH 84-12
TH 84-10
EXIST RC CHANNEL AND CULVERTS TO REMAIN
EXISTING BRIDGE TO REMAIN
PROPOSED BRIDGES
TH 84-11
CANYON
WILEY
TOWSLEY CANYON
PROPOSED DEBRIS BASIN
CHIQUELLA LANE
TH 84-7
FUTURE
WILEY CANYON ROAD
EXISTING CROSSING TO REMAIN
WILEY CANYON
TH 84-5
TH 84-6
CALGROVE
BLVD
THE OLD ROAD
MODIFY EXISTING BRIDGE
NEWHALL
TH 84-6
NOTE

VALUE ENGINEERING PAYS



SAFETY PAYS

PLATE C-3

1

2

TH 84-1

DEPTH	LOG	MC	γ_d	-4	-200	LL	PI	N	DESCRIPTION
7.0'	GM	4.4	117	63	27	30	7		SILTY SANDY GRAVEL, brown, damp, loose
10.0'	SM	7.4	115	77	18				SILTY GRAVELLY SAND, brown, moist, medium dense, some cobbles to 6"
13.5'	GM			54 53	20 20				SILTY SANDY GRAVEL, brown, moist, medium dense to dense, some cobbles to 6"
W 15.5'	SM-SC	5.1	112	70	27	27	6		SILTY GRAVELLY SAND / CLAYEY GRAVELLY SAND, brown, wet, dense
									very dense
23.0'									well cemented medium sand
	ML								SILT, brown with gray, moist, dense to very dense.
26.5'				100	94				gray, very dense

TH 84-2

DEPTH	LOG	MC	γ_d	-4	-200	LL	PI	N	DESCRIPTION
5.5'	SM			65	30				SILTY GRAVELLY SAND, brown, moist.
	SC	13.4	96	92	48	30	10		CLAYEY SAND, brown and light brown, occasional cobbles.
8.0'									layer of boulders to 3'.
9.5'	SM			84	34				GRAVELLY SILTY SAND, brown, moist, dense.
	CL								CLAY, brown with gray, moist, stiff.
17.5'		14.8	118	100	97	37	16		gray.

TH 84-3

DEPTH	LOG	MC	γ_d	-4	-200	LL	PI	N	DESCRIPTION
5.0'	SM	9.5	100	65	26				SILTY GRAVELLY SAND, light brown, moist, gravel to 3", cobbles to 6"
6.5'	GM			46	21				SILTY SANDY GRAVEL, light brown, moist, gravel to 3", cobbles to 6"
9.5'	CL	16.4	112	99	91	39	17		CLAY, gray, moist
17.5'	ML	13.5	115	100	86	34	10		SANDY SILT, gray, moist

TH 84-4

DEPTH	LOG	MC	γ_d	-4	-200	LL	PI	N	DESCRIPTION
3.5'	CL								SILTY CLAY, brown, moist
	SM	10.0	104	95	41				SILTY SAND, gray, moist
									brown and gray / orange, moist, some gravel to 3", cobbles to 6"
12.0'									GRAVELLY SILTY SAND, occasional cobbles, occasional boulders to 2'
17.0'	SW								GRAVELLY SAND, brown, numerous cobbles, boulders to 2'
18.5'	SM								SILTY SAND, brown, moist, medium dense.
21.5'	ML								SILT, gray, moist, dense to very dense

VERTICAL

TH 84-2

P	N	DESCRIPTION
		SILTY GRAVELLY SAND brown, moist
48 30	10	CLAYEY SAND brown and light brown, occasional cobbles, layer of boulders to 3'
34		GRAVELLY SILTY SAND brown moist, dense
		CLAY brown with gray moist stiff
37	6	gray

TH 84-4

P	N	DESCRIPTION
		SILTY CLAY brown moist
		SILTY SAND gray wet
		brown and gray / orange moist some gravel to 3" cobbles to 6"
		GRAVELLY SILTY SAND occasional cobbles, occasional boulders to 2'
		GRAVELLY SAND brown numerous cobbles boulders to 2'
		SILTY SAND brown moist medium dense
		SILT gray moist dense to very dense

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS More than half of material is larger than No. 200 sieve size.	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size.	Clean gravels	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines.
		Gravels with fines	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS More than half of coarse fraction is smaller than No. 4 sieve size.	Clean sands	SW	Well-graded sands, gravelly sands, little or no fines.
			SP	Poorly-graded sands, gravelly sands, little or no fines.
		Sands with fines	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS More than half of material is smaller than No. 200 sieve size.	SILTS AND CLAYS	Low liquid limit	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts, with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.
			OL	Organic silts and organic silty clays of low plasticity.
		High liquid limit	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity.
			OH	Organic clays of medium to high plasticity, organic silts.
Highly organic soils			Pt	Peat and other highly organic soils.

NOTES:

1. Boundary Classification: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example, GW-GC, well-graded gravel-sand mixture with clay binder.
2. All sieve sizes on this chart are U. S. Standard.
3. The terms "silt" and "clay" are used respectively to distinguish materials exhibiting lower plasticity from those with higher plasticity. The minus no. 200 sieve material is silt if the liquid limit and plasticity index plot below the "A" line on the plasticity chart, and is clay if the liquid limit and plasticity index plot above the "A" line on the chart.
4. The Soil Classification System is based on the American Society for Testing and Materials. (ASTM)
   a (ASTM) D2487 Standard Test Method for Classification of Soils for Engineering Purposes
   b (ASTM) D2487 Standard Recomended Practice for Description of Soils (Visual Manual Procedure).

LEGEND

T.H. ●	LOCATION AND NUMBER OF TEST HOLE.
MC	FIELD MOISTURE CONTENT IN PERCENT OF DRY WEIGHT.
LL	LIQUID LIMIT.
PI	PLASTICITY INDEX (LIQUID LIMIT MINUS PLASTIC LIMIT).
NP	NONPLASTIC
-4	PERCENT OF MATERIAL BY WEIGHT PASSING NO. 4 SIEVE.
-200	PERCENT OF MATERIAL BY WEIGHT PASSING NO. 200 SIEVE.
N	NUMBER OF BLOWS OF A 140-POUND DROPHAMMER FALLING 30 INCHES REQUIRED TO DRIVE A SAMPLING SPOON ONE FOOT. OUTSIDE DIAMETER OF SPOON IS 2 INCHES; INSIDE DIAMETER IS 1-3/8 INCHES. PROCEDURE IS CALLED STANDARD PENETRATION TEST.
W	DEPTH TO WATER
γ_d	DRY UNIT WEIGHT (PCF).

VERTICAL SCALE 5 0 5 10 15 FEET

NOTES:

1. SEE PLATE C-2 FOR LOCATION OF TEST HOLES.

SOUTH FORK SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA

SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

SOILS LOGS OF DEBRIS BASIN

TH84-1 THRU TH84-4

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE C-4

1

2

TT 84-1

DEPTH	LOG	MC	γd	-4	-200	LL	PI	N	DESCRIPTION
3.0'	ML			97	55				SANDY SILT, light brown, dry.
5.0'	SM			98	14				SILTY SAND, light brown, dry, organics
11.0'	GW-GM	9.1	105	48	6				SANDY GRAVEL/SILTY SANDY GRAVEL, brown, moist, dense to very dense, numerous (approx 50%) cobbles to 8", boulders to 2', roots at 8.0'
14.0'	GP-GM	4.2	116	48	7				SANDY GRAVEL/SILTY SANDY GRAVEL, brown, moist, dense to very dense

TT 84-2

DEPTH	LOG	MC	γd	-4	-200	LL	PI	N	DESCRIPTION
5.0	ML	8.1	112	98	59				SANDY SILT, light brown, dense, occasional cobble to 2'
				97	51				
10.0	[illegible] SM			66	8				GRAVELLY SAND / SILTY GRA brown, moist, dense to ve cobbles, occasional boul
11.0	SM			95	31				SILTY SAND, brown, moist,
w 14.0 / 15.0	SP SM			67	11				GRAVELLY SAND / SILTY GRA brown, moist, dense, numer 30%) boulders to 2

TT 84-4N

DEPTH	LOG	MC	γd	-4	-200	LL	PI	N	DESCRIPTION
5.0'	ML			95	66				SANDY SILT, brown, moist, loose, highly organic, trace of gravel; medium dense, trace of organics
8.0'	SM			94	22				SILTY SAND, brown, moist, medium dense
w 11.0'	GW-GM								SANDY GRAVEL / SILTY SANDY GRAVEL, brown, moist, dense, some cobbles, boulders to 3'

N = NORTH WALL OF TRENCH

TT 84-5

DEPTH	LOG	MC	γd	-4	-200	LL	PI	N	DESCRIPTION
1.5	CL			90	54	36	14		SANDY CLAY, brown, damp,
6.0	GM	6.4	108	50	15				SILTY SANDY GRAVEL, brow to very dense, cobbles o boulders to 2'
14.0	GP GM			20	8				GRAVEL / SILTY GRAVEL, br (approx 10%) cobbles, nu boulders to 5'
w 19.0	SM			60	19				SILTY GRAVELLY SAND, br numerous cobbles, numer
20.0	ML			92	58	33	7		SANDY SILT, brown and g dense, few gravel

TT 84-4S

DEPTH	LOG	MC	γd	-4	-200	LL	PI	N	DESCRIPTION
2.0'	SM								SILTY SAND, brown, moist, loose, highly organic.
w 8.0'	GW-GM			46	6				SANDY GRAVEL / SILTY SANDY GRAVEL, light brown, moist, dense, cobbles, boulders to 3'

S = SOUTH WALL OF TRENCH

TT 84-7

DEPTH	LOG	MC	γd	-4	-200	LL	PI	N	DESCRIPTION
2.0	CL			100	69	30	9		SANDY CLAY, brown with damp, dense
5.0'	SM			67	23				SILTY GRAVELLY SAND, l brown, moist, medium den; light brown, denser
10.0	GM			54	14				SILTY SANDY GRAVEL, bro to very dense, numerous boulders to 5'

TT 84-2

DEPTH	LOG	MC	γd	4	200	LL	PI	N	DESCRIPTION
	ML	8.1	112	98	59				SANDY SILT, light brown, dry, medium dense, occasional cobbles, boulders to 2'
5.0'				97	51				
	GM SM			66	8				GRAVELLY SAND / SILTY GRAVELLY SAND, brown, moist, dense to very dense, cobbles, occasional boulders to 2'
10.0'	SM			95	31				SILTY SAND, brown, moist, dense
11.0'	GP SM			67	11				GRAVELLY SAND / SILTY GRAVELLY SAND, brown, moist, dense numerous (approx 30%) boulders to 2'
# 14.0' / 15.0'									

TT 84-3

DEPTH	LOG	MC	γd	4	200	LL	PI	N	DESCRIPTION
	CL			99	64	34	11		SANDY CLAY, light brown, dry, loose
									moist, medium dense
8.5				100	71	28	8		
	CL-ML			100	71	27	6		SANDY CLAY / SANDY SILT, light brown, moist
15.0									

TT 84-5

DEPTH	LOG	MC	γd	4	200	LL	PI	N	DESCRIPTION
1.5'	CL			96	54	36	14		SANDY CLAY, brown, damp, medium dense
	GM	6.4	108	50	5				SILTY SANDY GRAVEL, brown, moist, dense to very dense, cobbles, occasional boulders to 2'
6.0	GP GM			20	8				GRAVEL / SILTY GRAVEL, brown, moist, numerous (approx 10%) cobbles, numerous (approx 20%) boulders to 5'
14.0	SM			60	19				SILTY GRAVELLY SAND, brown, moist, dense, numerous cobbles, numerous boulders
# 19.0' / 20.0'	ML			92	58	33	7		SANDY SILT, brown and grey, moist, very dense, few gravel

TT 84-6

DEPTH	LOG	MC	γd	4	200	LL	PI	N	DESCRIPTION
	ML			99	59	25	4		SANDY SILT, light brown, damp, medium dense
				99	55				
10.0	SM	5.0	108	96	47	23	2		SILTY SAND, light brown, moist, some gravel
12.0	ML			99	69	28	4		SANDY SILT, light brown, moist
									gravel lens, cobbles to 6"
17.0	SM			94	40				SILTY SAND, wet, occasional cobbles to 12"
20.0									

TT 84-7

DEPTH	LOG	MC	γd	4	200	LL	PI	N	DESCRIPTION
2.0'	CL			100	69	30	9		SANDY CLAY, brown with orange spots, damp, dense
	SM			67	23				SILTY GRAVELLY SAND, light brown to brown, moist, medium dense
5.0'									light brown, denser
	GM			54	14				SILTY SANDY GRAVEL, brown, damp, dense to very dense, numerous cobbles and boulders to 5'
10.0'									

VERTICAL SCALE 5 0 5 10 15 FEET

NOTES
1) SEE PLATE C-2 FOR LOCATION OF TEST TRENCHES
2) SEE PLATE C-4 FOR LEGEND AND SOIL CLASSIFICATION.

SOUTH FORK SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA

SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

SOILS LOGS OF DEBRIS BASIN

TT84-1 THRU TT84-7

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE C-5

2

TT 84-8

DEPTH	LOG	MC	γ_d	-4	-200	LL	PI	N	DESCRIPTION
6.0'	GM			42	21				SANDY SILTY GRAVEL; brown, moist, cobbles, numerous boulders to 6'.
10.0'	SM	7.8	110	97	46				SILTY SAND, brown moist, occasional boulders to 6'.
16.0'	ML								SANDY SILT; moist, medium dense to dense, some gravel.
18.5'	GM	5.7	107	56	15				SILTY SANDY GRAVEL, light brown, moist, dense to very dense, cobbles, numerous (approx. 70%) boulders to 5'.
20.0'	ML								SILT, grey, moist, very dense.

TT 84-9

DEPTH	LOG	MC	γ_d	-4	-200	LL	PI	N	DESCRIPTION
4.5'	SM			93	15	27	4		SILTY SAND; brown, moist, medium dense, some gravel, some cobbles, occasional boulder to 3'. gravel lens.
6.0'	ML	14.5	101	89	52				SANDY SILT; brown, moist, dense, few gravel.
8.5'	SM			94	44				SILTY SAND; brown, moist, dense, few cobbles, occasional boulder to 4'.
10.0'	GM	11.0	85	63	29				SILTY SANDY GRAVEL; brown, moist, medium dense.
15.0'	SM			75	42				SILTY SAND, brown moist.

TT 84-11

DEPTH	LOG	MC	γ_d	-4	-200	LL	PI	N	DESCRIPTION
3.5'	SM								SILTY SAND, light brown, damp, medium dense, few gravel.
8.0'	SP-SM	2.8	107	62	11				GRAVELLY SAND / SILTY GRAVELLY SAND, light brown, damp, dense to very dense, many cobbles, numerous (approx. 70%) boulders to 4'.
10.5'	SW-SM								SAND / SILTY SAND, light brown, damp, medium dense, some gravel and cobbles, occasional boulders to 3'.

TT 84-12

DEPTH	LOG	MC	γ_d	-4	-200	LL	PI	N	DESCRIPTION
3.5'	GW-GM			44	5				SANDY GRAVEL/SILTY GRAVELLY SAND, brown, moist, medium dense, cobbles, boulders to 5'
7.0'	ML			100	91	36	10		SILT, brown and grey, moist, dense to very dense.

VER

NO

TT 84-9

DEPTH	LOG	MC	γ_d	-4	-200	LL	PI	N	DESCRIPTION
	SM			93	15	27	4		SILTY SAND, brown, moist, medium dense, some gravel, some cobbles, occasional boulder to 3'. gravel lens
60'	ML	14.5	101	89	52				SANDY SILT, brown, moist, dense, few gravel.
85'	SM			94	44				SILTY SAND; brown, moist, dense, few cobbles, occasional boulder to 4'
100'	GM	11.0	85	63	29				SILTY SANDY GRAVEL, brown, moist, medium dense.
60'	SM			75	42				SILTY SAND, brown moist.

TT 84-10

DEPTH	LOG	MC	γ_d	-4	-200	LL	PI	N	DESCRIPTION
40'	ML			98	73	29	6		SANDY SILT, light brown, damp, medium dense.
60'	GM			69	29				SILTY GRAVELLY SAND, light brown, damp, dense, occasional cobbles, occasional boulders to 3'.
90'	SP-SM			88	12				sand lens, brown.
	GW-GM	3.1	100	38	7				SAND / SILTY SAND; brown, damp, dense, cobbles boulders to 2'.
				48	9				SANDY GRAVEL / SILTY SANDY GRAVEL, brown, damp, dense, numerous boulders to 3'
130'				49	8				gray brown, moist, dense, occasional cobbles to 4'.

TT 84-12

DEPTH	LOG	MC	γ_d	-4	-200	LL	PI	N	DESCRIPTION
5.5'	GW-GM			44	5				SANDY GRAVEL/SILTY GRAVELLY SAND, brown, moist, medium dense, cobbles, boulders to 5'
7.0'	ML			100	91	36	10		SILT, brown and gray, moist, dense to very dense.

VERTICAL SCALE 5 0 5 10 15 FT

NOTES:

1. See plate C-2 for location of test trenches.
2. See plate C-4 for legend and soil classification

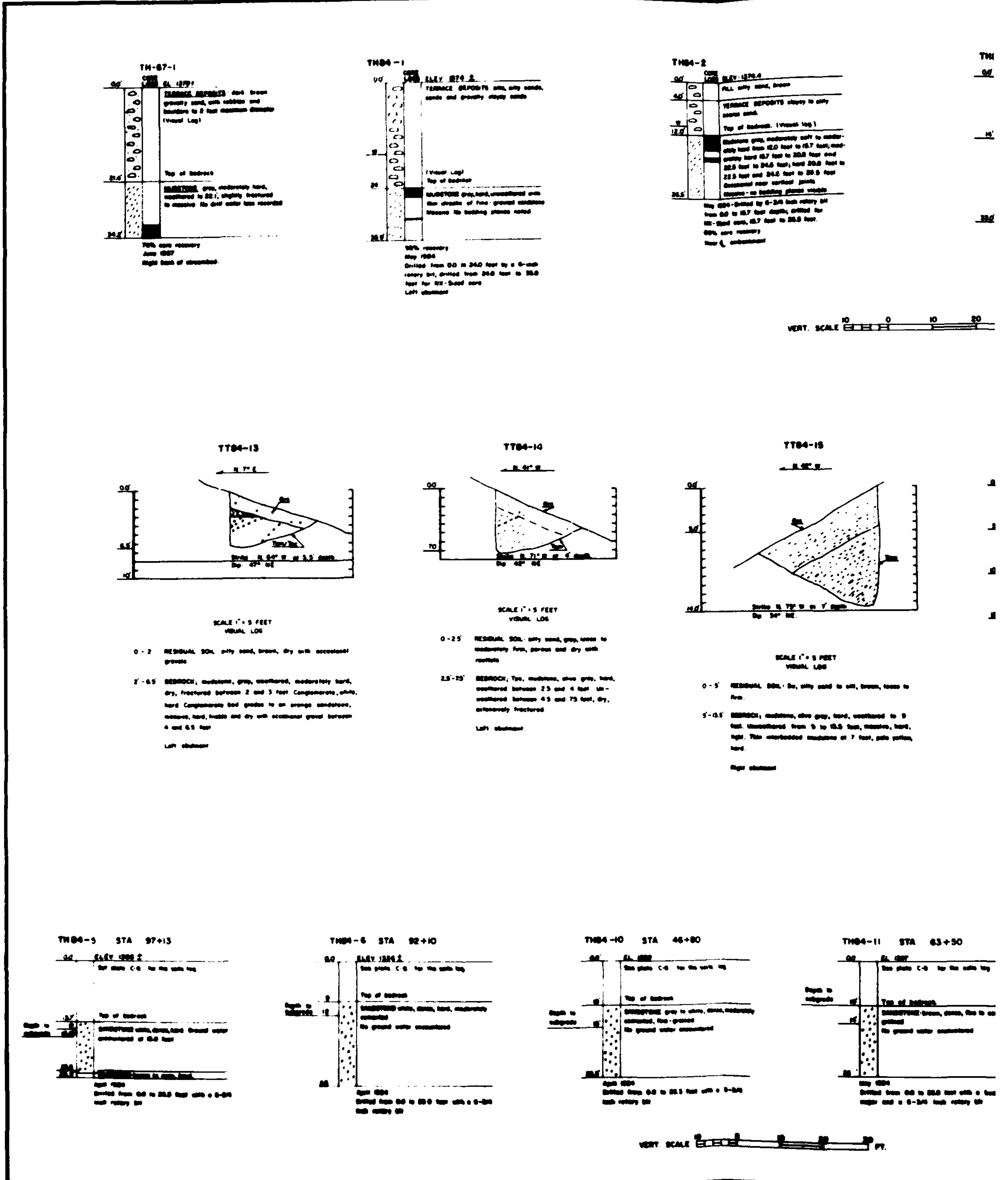
SOUTH FORK SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA

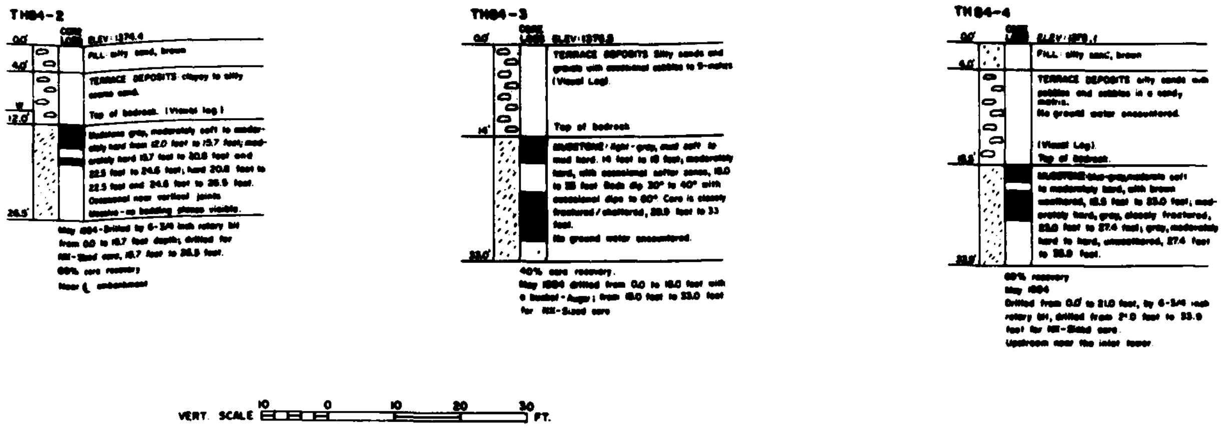
SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

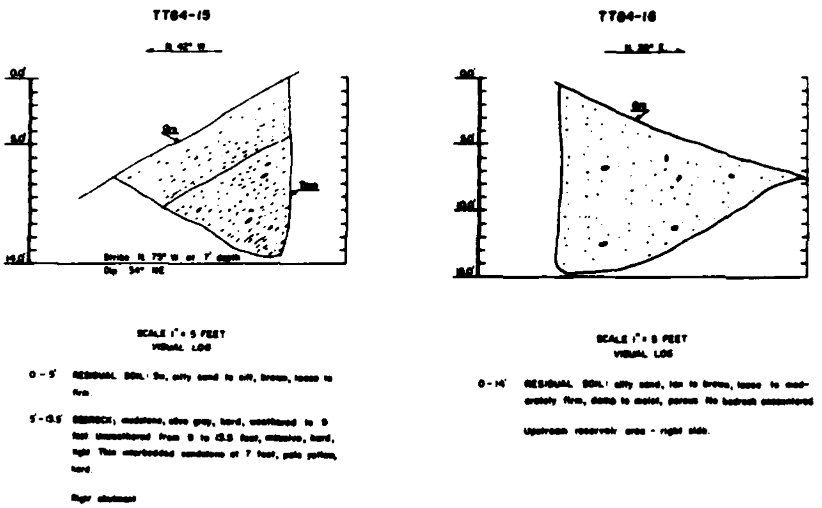
SOILS LOGS OF DEBRIS BASIN

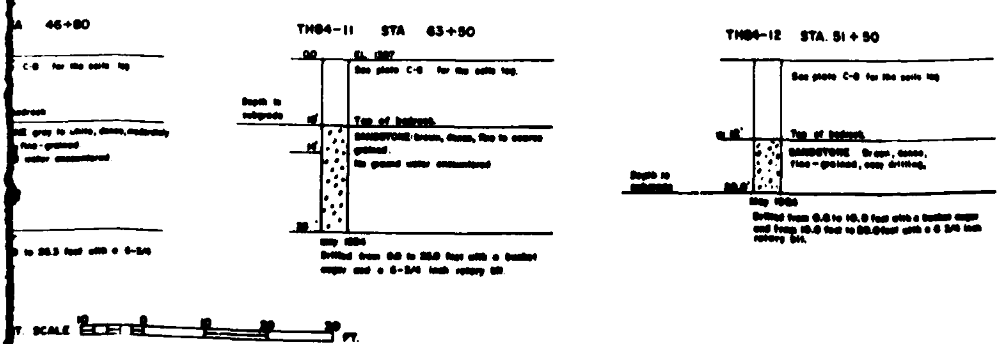
TT84-6 THRU TT84-12

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

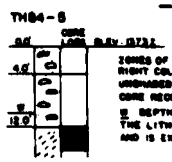

TH-67-1
CORE LOG EL 1279±
TERRACE DEPOSITS dark brown gravelly sand, with cobbles and boulders to 2 foot maximum diameter (Visual Log)
Top of bedrock
MUDSTONE gray, moderately hard, weathered to 22.1, slightly fractured to massive. No drill water loss recorded
70% core recovery
June 1967
Right bank of streambed.
TH84-1
CORE LOG ELEV 1274 ±
TERRACE DEPOSITS silts, silty sands, sands and gravelly clayey sands
(Visual Log)
Top of bedrock
MUDSTONE gray, hard, unweathered with thin streaks of fine-grained sandstone blebs. No bedding planes noted
98% recovery
May 1984
Drilled from 0.0 to 24.0 feet by a 6-inch rotary bit, drilled from 24.0 feet to 30.0 feet for NX-3 core
Left abutment
TH84-2
CORE LOG ELEV 1276.4
FILL silty sand, brown
TERRACE DEPOSITS clayey to silty coarse sand.
Top of bedrock. (Visual log)
Mudstone gray, moderately soft to moderately hard from 12.0 feet to 15.7 feet; moderately hard 15.7 feet to 20.0 feet and 22.5 feet to 24.6 feet; hard 20.0 feet to 22.5 feet and 24.6 feet to 26.5 feet. Occasional near vertical joints. Massive - no bedding planes visible
May 1984 - Drilled by 6-3/4 inch rotary bit from 0.0 to 15.7 feet depth; drilled for NX-3 core, 15.7 feet to 26.5 feet.
60% core recovery
Near ℄ embankment
VERT. SCALE 10 0 10 20
TT84-13
N 7° E
Strike N 64° W at 5.5' depth
Dip 47° NE
SCALE 1" = 5 FEET
VISUAL LOG
0 - 2 RESIDUAL SOIL silty sand, brown, dry with occasional gravels
2' - 6.5' BEDROCK; mudstone, gray, weathered, moderately hard, dry, fractured between 2 and 3 feet. Conglomerate, white, hard. Conglomerate bed grades to an orange sandstone, massive, hard, friable and dry with occasional gravel between 4 and 6.5 feet
Left abutment
TT84-14
N 41° W
Strike N 71° W at 4' depth
Dip 42° NE
SCALE 1" = 5 FEET
VISUAL LOG
0 - 2.5' RESIDUAL SOIL silty sand, gray, loose to moderately firm, porous and dry with rootlets
2.5' - 7.5' BEDROCK; Tpo, mudstone, olive gray, hard, weathered between 2.5 and 4 feet. Unweathered between 4.5 and 7.5 feet, dry, extensively fractured.
Left abutment.
TT84-15
N 48° W
Strike N 79° W at 7' depth
Dip 34° NE.
SCALE 1" = 5 FEET
VISUAL LOG
0 - 5' RESIDUAL SOIL silty sand to silt, brown, loose to firm.
5' - 13.5' BEDROCK; mudstone, olive gray, hard, weathered to 9 feet. Unweathered from 9 to 13.5 feet, massive, hard, tight. Thin interbedded mudstone at 7 feet, pale yellow, hard.
Right abutment
TH84-5 STA 97+13
ELEV 1300 ±
See plate C-6 for the soils log
Top of bedrock
Depth to subgrade
SANDSTONE white, dense, hard. Ground water encountered at 13.0 feet
April 1984
Drilled from 0.0 to 20.0 feet with a 6-3/4 inch rotary bit
TH84-6 STA 92+10
ELEV 1326 ±
See plate C-6 for the soils log
Top of bedrock
Depth to subgrade
SANDSTONE white, dense, hard, moderately cemented
No ground water encountered
April 1984
Drilled from 0.0 to 20.0 feet with a 6-3/4 inch tooth rotary bit
TH84-10 STA 46+80
See plate C-6 for the soils log
Top of bedrock
Depth to subgrade
SANDSTONE gray to white, dense, moderately cemented, fine-grained
No ground water encountered
April 1984
Drilled from 0.0 to 20.5 feet with a 6-3/4 inch tooth rotary bit
TH84-11 STA 63+50
See plate C-6 for the soils log
Depth to subgrade
Top of bedrock
SANDSTONE brown, dense, fine to co
No ground water encountered
May 1984
Drilled from 0.0 to 20.0 feet with a 4 inch auger and a 6-3/4 inch tooth rotary bit
VERT. SCALE 10 0 10 20 30 FT.







LEGEND



ZONES OF CORE LOSS IN BEDROCK ARE SHADED IN THE RIGHT COLUMN FOR THE INTERVAL OF CORE LOSS UNSHADED BLOCKS IN BEDROCK ARE ZONES OF 100% CORE RECOVERY

DEPTH TO WATER

THE LITHOLOGY IS GRAPHICALLY SHOWN IN THE LEFT AND IS EXPLAINED ON PLATE

NOTES:

1. SEE PLATES C-2 AND C-3 FOR GEOLOGIC MAP AND LOCATION OF TEST HOLES AND TEST TRENCHES.
2. ALL SOILS DESCRIPTIONS ON THIS PLATE ARE VISUAL.
3. SEE PLATES C-4 THRU 6 AND C-8 FOR COMPLETE SOILS LOGS.

NATIONAL GEODETIC VERTICAL DATUM OF 1929

SOUTH FORK SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA

SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

GEOLOGIC LOGS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE C-7

TH 84-5

DEPTH	LOG	MC	γd	-4	-200	LL	PI	N	DESCRIPTION
3.0'	CL								SILTY CLAY, brown, plastic.
7.5'	ML								CLAYEY SILT, brown, moist, very stiff to hard, slightly plastic, trace of orange oxidation.
10.0'	SM	18.5	97	70	15		NP		SILTY GRAVELLY SAND, brown, very porous at 10.0'
13.7'	CL	16.8	94	99	79	31	13		SANDY CLAY, brown, hard.
15.0'	SC								CLAYEY SAND, white dense to very dense well cemented.
20.5'	CL	15.3	105	94	70	31	10		SANDY CLAY, brown, very stiff to hard, plastic, fine to medium grained sand.
25.5'	ML	19.2	104	100	99	34	9		CLAYEY SILT
26.5'	CL			100	91	35	13		CLAY, grey, moist, very stiff to hard.

TH 84-6

DEPTH	LOG	MC	γd	-4	-200	LL	PI	N	DESCRIPTION
	SM								SILTY GRAVELLY SAND, light brown, dry to moist, loose, occasional cobble to 4"
	SM			72	17		NP		SILTY SAND
9.0'	SM								slight cohesion
	SP								GRAVELLY SAND, white, dense
14.0'	SP								very dense
	SM								SILTY SAND, easy drilling
	SM								difficult drilling
28.0'	SM								pinkish brown very difficult drilling
	MH								SILT, grey very dense

TH

DEPTH	LOG	MC	γd	-4	-200	LL	PI
3.0'							
				62	23	28	6
7.0'							
		10.5	102	96	34		NP
8.5'							
10.0'							
		3.1	114	86	11		NP
11.5'							
		13.9	99	58	15		NP
20.0'							
	SM/SC	8.8	117	64	23	24	5
23.0'							

TH 84-9

DEPTH	LOG	MC	γd	-4	-200	LL	PI	N	DESCRIPTION
3.5'	SM								GRAVELLY SILTY SAND, brown moist, slightly plastic, some clay
4.5'	SC								boulder to 13" debris (wood, nails, etc.)
	SM	8.9	100	84	22		NP		GRAVELLY CLAYEY SAND, mottled, light brown with brown and grey brown, moist, medium dense, plastic, cobbles to 8"
8.0'	SM			74	26		NP		GRAVELLY SILTY SAND, brown, moist medium dense, occasional cobble
									severe caving, stopped drilling at 8.0 due to cobbles and boulders

TH 84-10

DEPTH	LOG	MC	γd	-4	-200	LL	PI	N	DESCRIPTION
	SM								GRAVELLY SILTY SAND, brown, occasional cobbles
	SM								increase in cobbles
25.0'	SM								many cobbles, cuttings are mottled, grey and white with orange and red flakes, no fines, very difficult drilling
26.3'	SM-	6		65	9		NP		GRAVELLY SAND/SILTY GRAVELLY SAND, grey, very dense, well cemented

TH

DEPTH	LOG	MC	γd	-4	-200	LL	PI
	SM	8.1	98	80	32		NP
	SM	8.2	101	98	32		NP
	SM	13.8	111	100	45		NP
18.5'	SM			11	3		NP
25.0'	GP						
26.0'	SC			64	25		NP

VALUE ENGINEERING PAYS

DESCRIPTION
GRAVELLY SAND, light brown, to moist, loose, occasional to 4"
SAND cohesion
LLY SAND, white, dense
dense
SAND, easy drilling
cult drilling
brown, very difficult drilling
grey very dense

TH 84-7

DEPTH	LOG	MC	γd	-4	-200	LL	PI	N	DESCRIPTION
									SILTY SAND, light brown, dry to moist loose, fine grained sand, trace of gravel.
3.0'				62	23	28	6		SILTY GRAVELLY SAND/CLAYEY GRAVELLY SAND, dry to moist, slight plasticity, occasional cobble.
7.0'		10.5	102	96	34		NP		SILTY SAND, brown, moist, loose
8.5'									SAND, brown, moist, fine to medium grained sand, trace of silt.
10.0		3.1	114	88	11		NP		
11.5									SAND/SILTY SAND, brown, moist
									GRAVELLY SILTY SAND, brown, slight plasticity trace of cobbles.
		13.9	99	58	15		NP		SILTY GRAVELLY SAND, brown, moist, dense
20.0	SM/SC	8.8	117	64	23	24	5		SILTY GRAVELLY SAND/CLAYEY GRAVELLY SAND, brown, moist, dense
23.0'									

TH 84-8

DEPTH	LOG	MC	γd	-4	-200	LL	PI	N	DESCRIPTION
	SM								SILTY GRAVELLY SAND, brown, medium dense to dense, slightly plastic
		3.6	108	65	17		NP		moist, medium dense, easy to drill, non plastic.
									cobbles to 9", severe caving
				70	20		NP		medium dense
		4.7	110	85	14		NP		trace of clay, slight cohesion
									cobbles to 12"
									no gravel, no cobbles
19.2'									many cobbles to 12"

DESCRIPTION
LLY SILTY SAND brown, occasional
es in cobbles
cobbles, cuttings are mottled, grey h to with orange and red flakes, no very difficult drilling
LLY SAND/SILTY GRAVELLY SAND, grey, dense well cemented

TH 84-11

DEPTH	LOG	MC	γd	-4	-200	LL	PI	N	DESCRIPTION
	SM								GRAVELLY SILTY SAND, light brown, dry to moist, medium dense
									some gravel, cobbles and boulders to 13"
		8.1	98	80	32		NP		GRAVELLY SILTY SAND, brown, moist, medium dense, few boulders
		8.2	101	98	32		NP		SILTY SAND
		13.8	111	100	45		NP		fine to medium grained sand
18.5'	GP			11	3		NP		GRAVEL, brown, moist, very dense
25.0									
26.0'	SC			64	25		NP		SILTY GRAVELLY SAND, brown, very dense

TH 84-12

DEPTH	LOG	MC	γd	-4	-200	LL	PI	N	DESCRIPTION
	SM								SILTY SAND, light brown, moist, medium dense, fine to medium grained sand
4.0'	GM			52	17		NP		SILTY SANDY GRAVEL, few cobbles
5.5	SM								GRAVELLY SILTY SAND, brown, moist, medium dense, few cobbles to 7"
									trace of clay
		5.7	122	59	18		NP		SILTY GRAVELLY SAND, brown, moist, medium dense
									GRAVELLY SILTY SAND, brown, moist, medium dense, many cobbles to 9", very hard drilling
12.0	SW-SM								SAND/SILTY SAND, very dense, non plastic, difficult drilling
14.0'	SM								SILTY SAND, brown, easy drilling, severe caving
20.0'									

VERTICAL SCALE 5 0 5 10 15 FEET

NOTES
1. SEE PLATE C-2 FOR LOCATION OF TEST HOLES
2. SEE PLATE C-4 FOR LEGEND AND SOIL CLASSIFICATION

SOUTH FORK SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA

SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

SOILS LOGS OF CHANNEL

TH84-6 THRU TH84-12

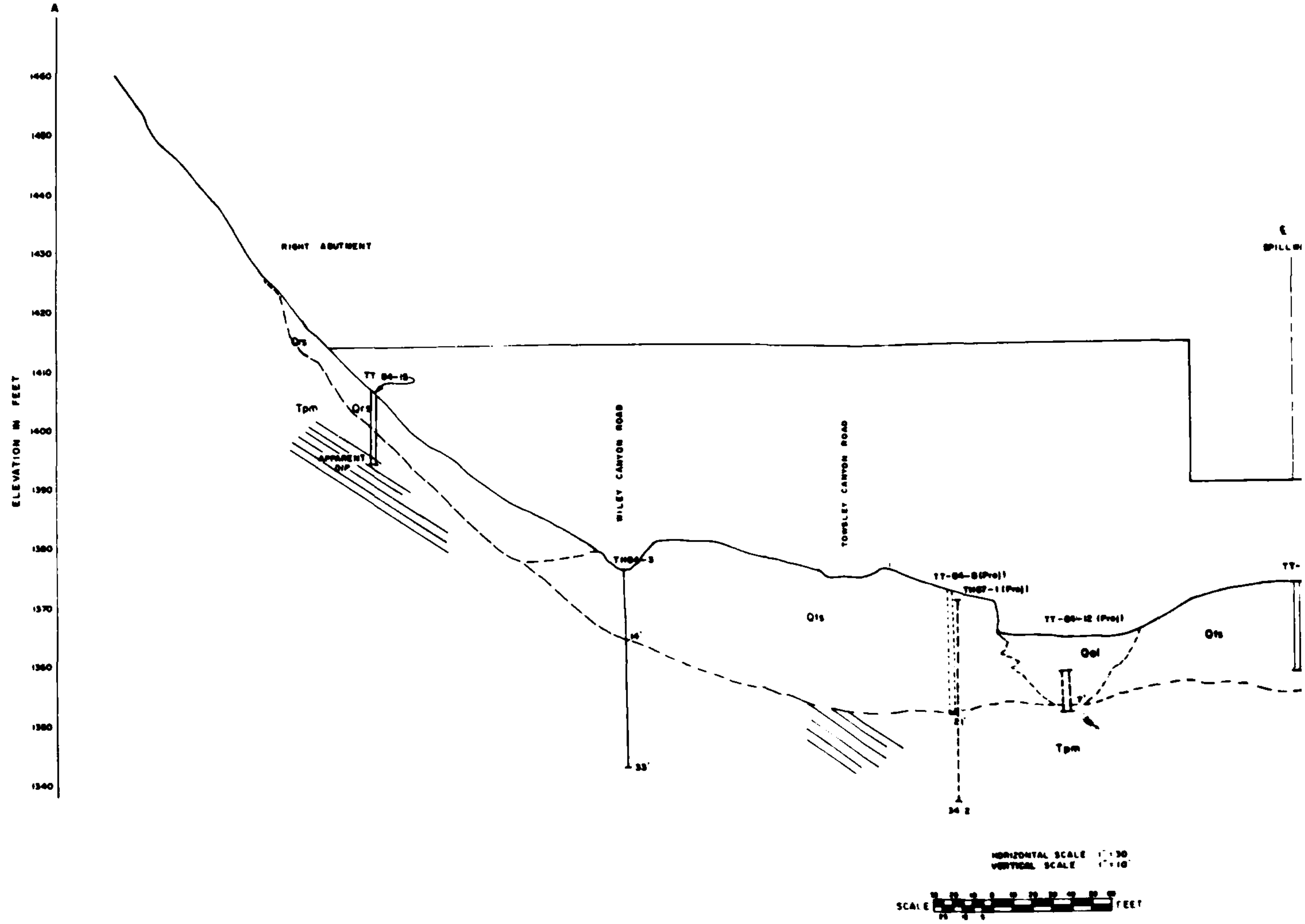
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

SAFETY PAYS

1

2

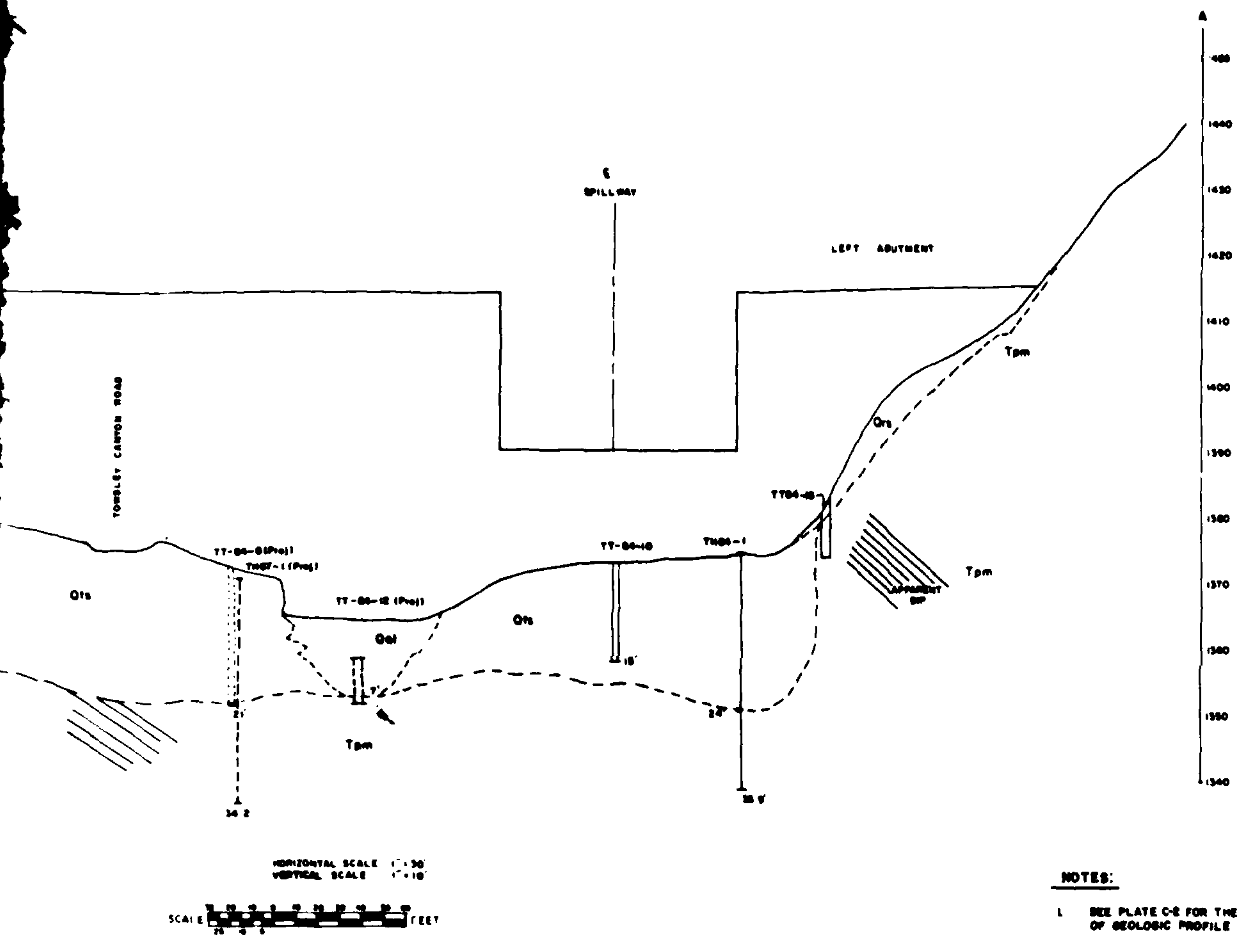
VALUE ENGINEERING PAYS



PROFILE

SAFETY PAYS

VALUE ENGINEERING PAYS



PROFILE

NOTES:

1. SEE PLATE C-2 FOR THE PLAN OF EXPLORATION AND THE LOCATION OF GEOLOGIC PROFILE A—A.
2. SEE PLATE C-2 FOR THE NOTES AND LEGEND.
3. SEE PLATE C-4 THRU 7 FOR LOGS OF TEST HOLES AND TEST TRENCHES.

NATIONAL GEODETIC VERTICAL DATUM OF 1929

SOUTH FORK SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA

SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

GEOLOGIC PROFILE A-A

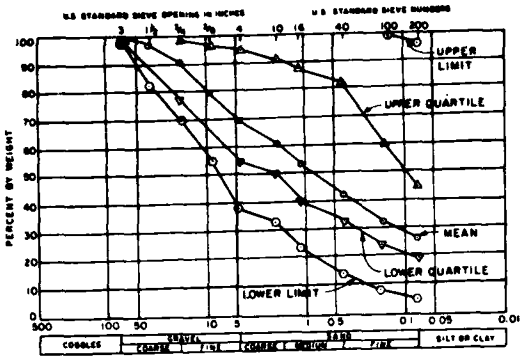
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE C-9

SAFETY PAYS

1

2



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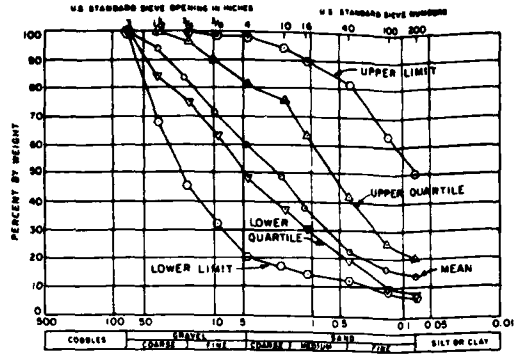
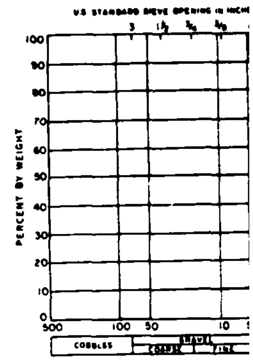


RANDOM MATERIAL



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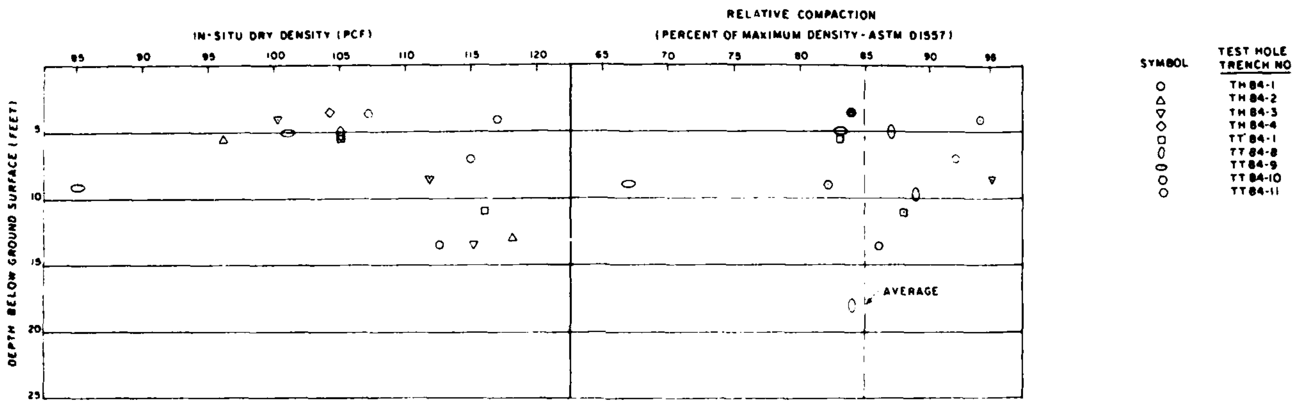
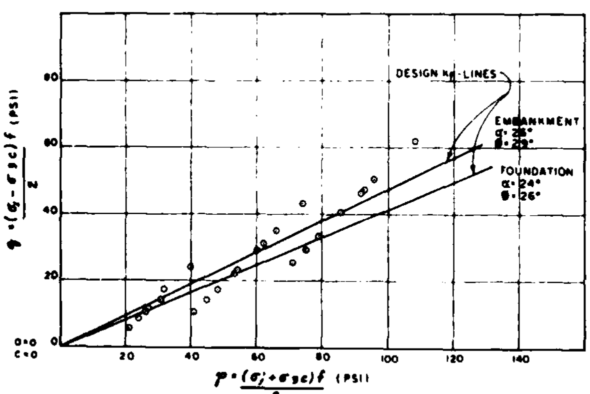
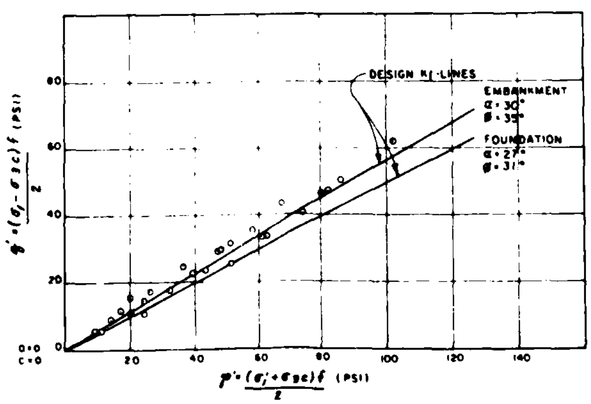
GRADATION CURVES



FOUNDATION IN-SITU DENSITY AND RELATIVE COMPACTION RESULTS



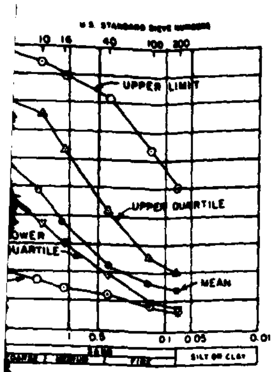
CONSOLIDATED UNDRAINED (R) STRENGTH



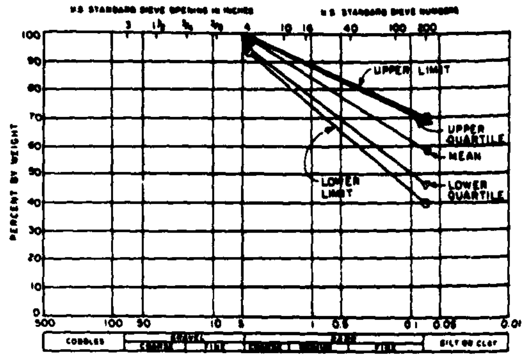
CONSOLIDATED DRAINED (S) STRENGTH

$\bar{R}$ TRIAXIAL TEST RESULTS

MODIFIED MOHR DIAGRAMS

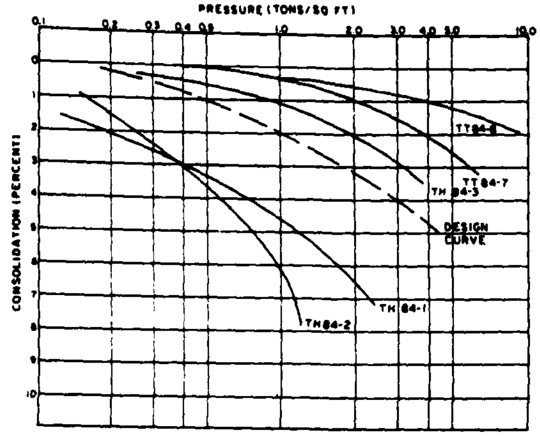


M MATERIAL



CORE MATERIAL

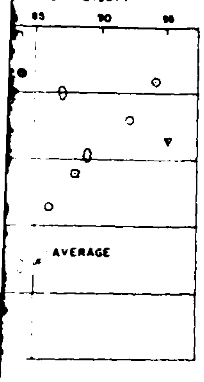
ION CURVES



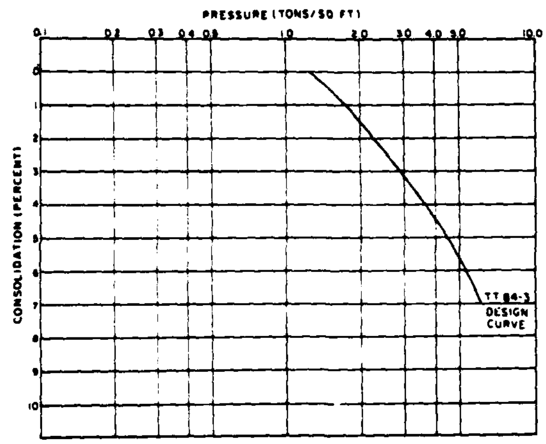
FOUNDATION AND RANDOM MATERIALS

TION

TY - ASTM D1557)

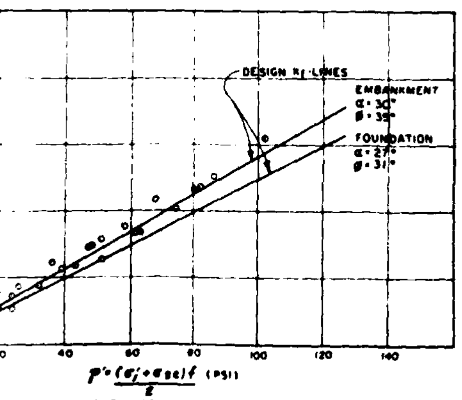


SYMBOL	TEST HOLE TRENCH NO
○	TH 84-1
△	TH 84-2
▽	TH 84-3
◇	TH 84-4
□	TT 84-1
0	TT 84-8
0	TT 84-9
○	TT 84-10
○	TT 84-11



CORE MATERIAL

CONSOLIDATION CURVES



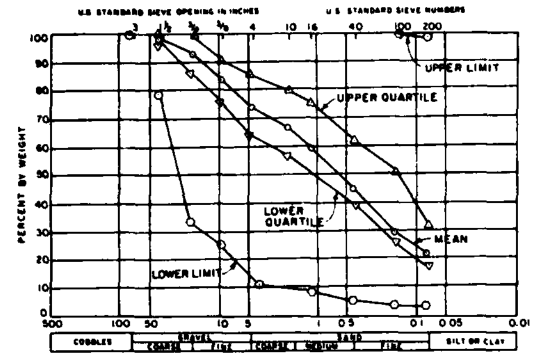
CONSOLIDATED DRAINED (S) STRENGTH

SOUTH FORK SANTA CLARA RIVER LOS ANGELES COUNTY, CALIFORNIA
SOUTH FORK OF THE SANTA CLARA RIVER DEBRIS BASIN AND CHANNEL IMPROVEMENT DEBRIS BASIN LABORATORY TEST RESULTS
U.S. ARMY CORPS OF ENGINEERS LOS ANGELES DISTRICT

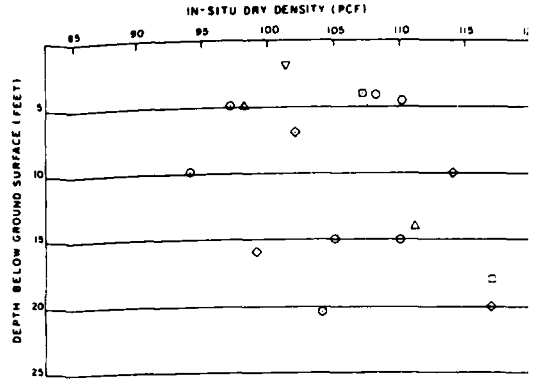
PLATE C-10

1

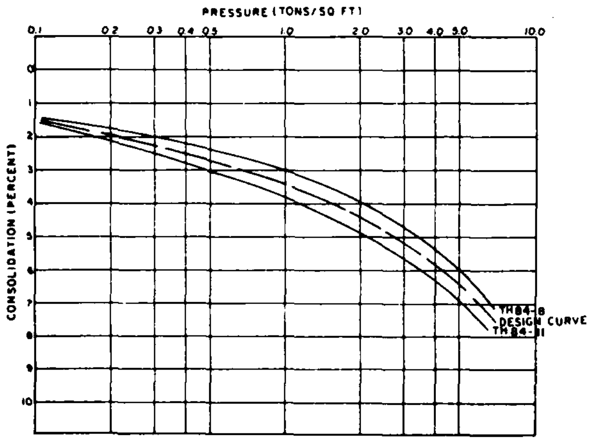
2



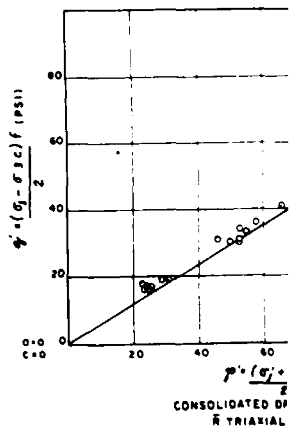
GRADATION CURVES



FOUNDATION IN-SITU DENSITY AND



CONSOLIDATION CURVES



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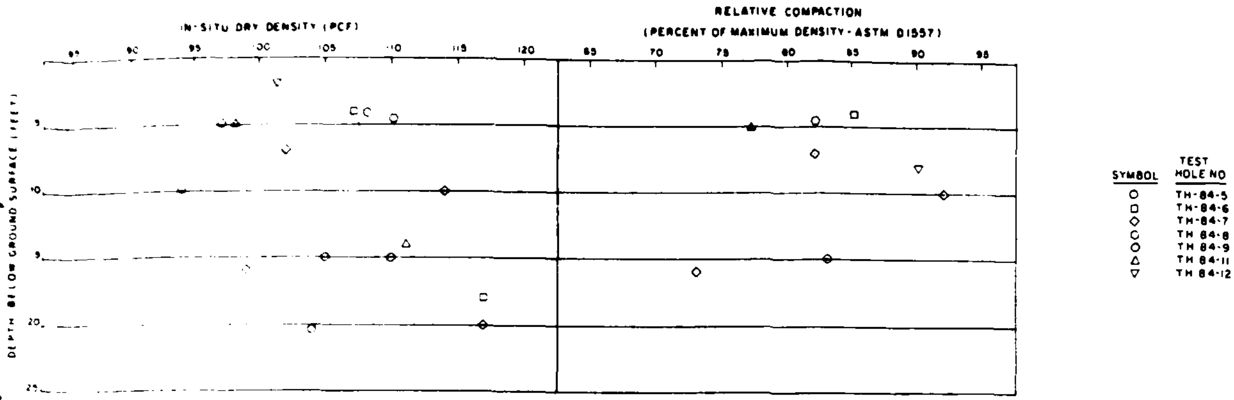
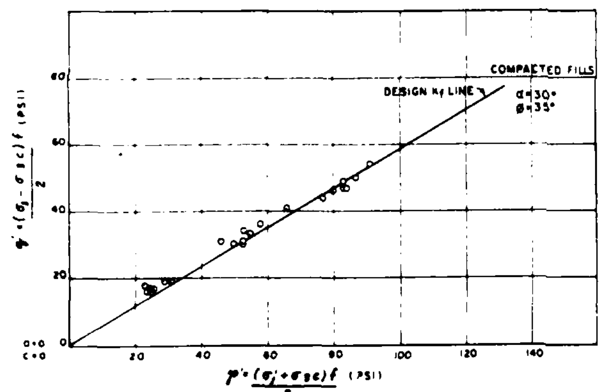


FOUNDATION IN-SITU DENSITY AND RELATIVE COMPACTION RESULTS



CONSOLIDATED DRAINED (S) STRENGTH
$\bar{R}$ TRIAXIAL TEST RESULTS

MODIFIED MOHR DIAGRAM

SOUTH FORK SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA

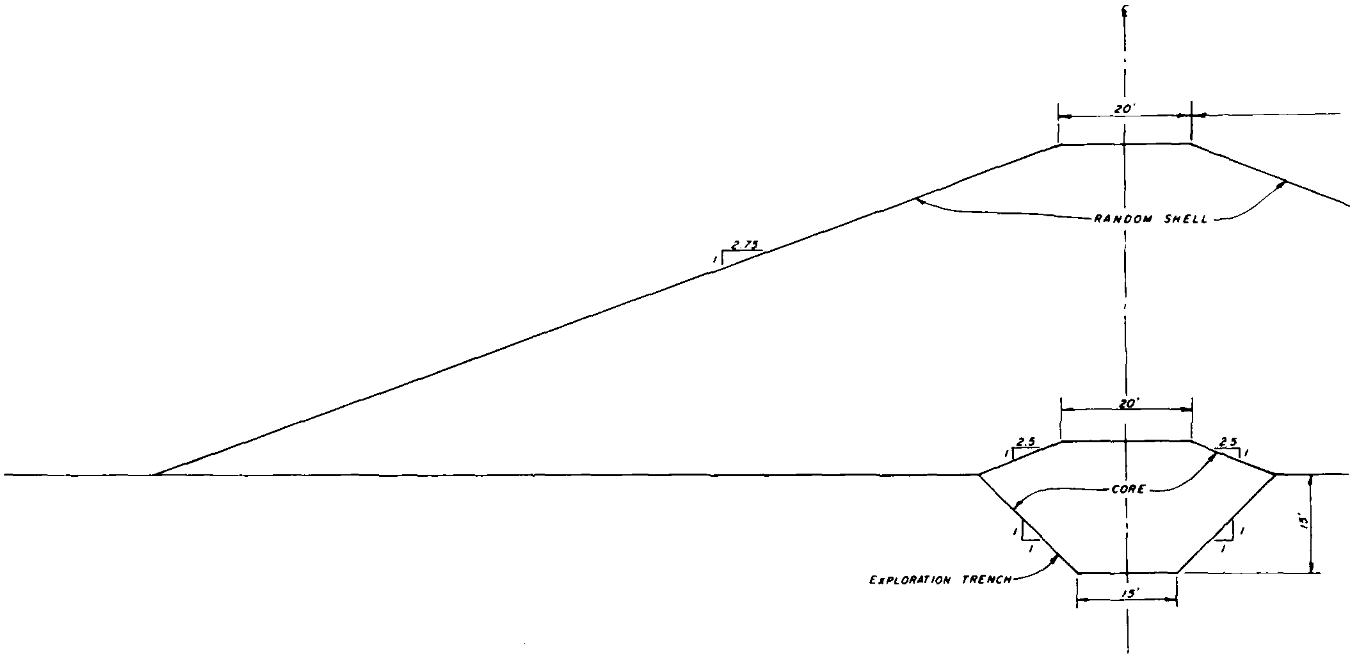
SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

CHANNEL

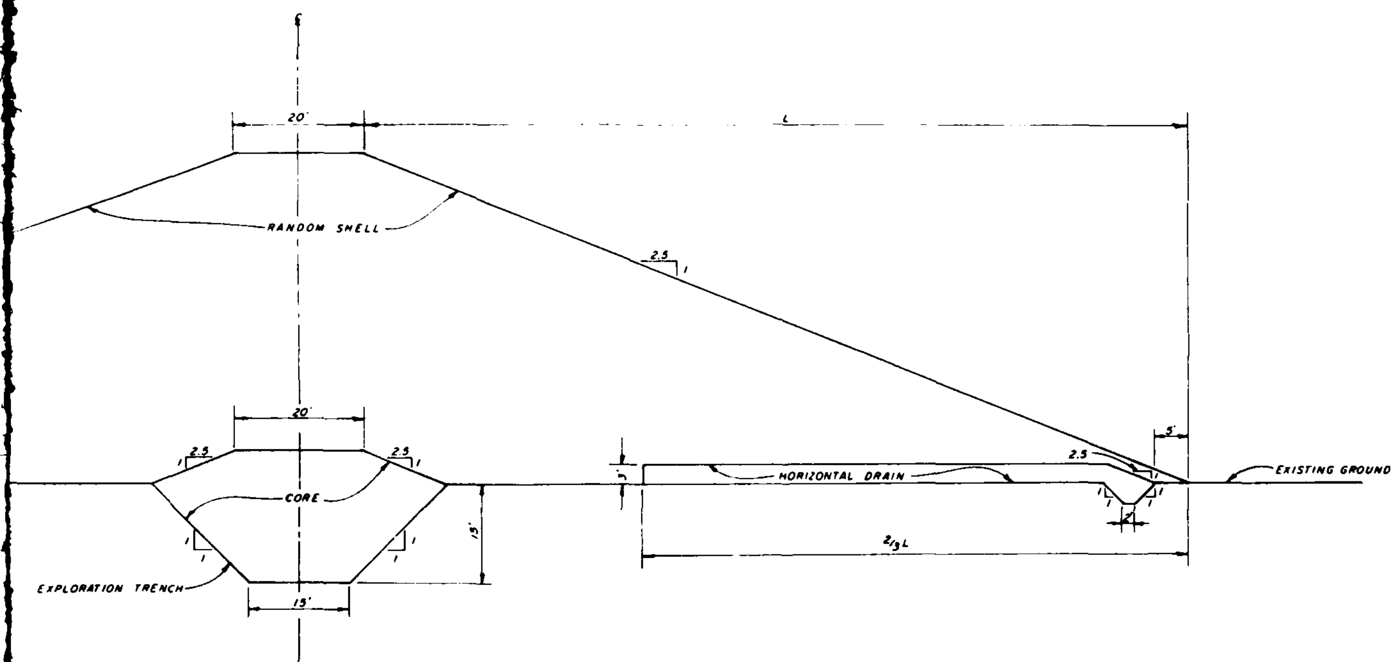
LABORATORY TEST RESULTS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE C-11



TYPICAL SECTION
SCALE 1 IN. = 10 FT.



TYPICAL SECTION
SCALE 1 IN. = 10 FT.

NOTE:
1 DETAILS OF HORIZONTAL DRAIN WILL BE COMPLETED DURING PLANS AND SPECS

SCALE: 1 IN. = 10 FT
10 0 10 20 30

SOUTH FORK SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA

SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

DEBRIS BASIN

TYPICAL EMBANKMENT CROSS SECTION

U S ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

APPENDIX D

ENGINEERING DESIGN AND COST ESTIMATES

SUPPLEMENT TO
DETAILED PROJECT REPORT
FOR FLOOD CONTROL

SOUTH FORK OF THE SANTA CLARA RIVER
SANTA CLARITA VALLEY
CALIFORNIA

JANUARY 1985

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D-4	South Fork Channel Plan and Profile Sta 79+40 to Sta 90+79.29
D-5	South Fork Channel Plan and Profile Sta 66+71.74 to Sta 79+40
D-6	South Fork Channel Plan and Profile Sta 55+56.97 to D/S Sta 67+38.59 = U/S Sta 66+71.74
D-7	South Fork Channel Plan and Profile Sta 46+00 to Sta 55+56.97
D-8	South Fork Channel Plan and Profile Sta 32+60 to Sta 46+00
D-9	South Fork Channel Plan and Profile Sta 21+00 to Sta 32+60
D-10	South Fork Channel Plan and Profile U/S Sta 7+00 = D/S Sta 208+90 to Sta 21+00
D-11	South Fork Channel Plan and Profile Sta 196+73.68 to Sta 208+90
D-12	South Fork Channel Plan and Profile Sta 183+29 to Sta 196+73.68
D-13	South Fork Channel Plan and Profile Sta 175+00 to Sta 183+29
D-14	Lyon Canyon Channel Plan and Profile and Gavin Canyon Channel Profile and Details
D-15	Towsley Debris Basin Right of Way Plan

HYDRAULIC DESIGN

I. INTRODUCTION

1.01 General. The hydraulic design of the proposed South Fork of the Santa Clara River channel improvements is based on approved design practice and on theoretical analysis, using applicable criteria set forth in EM 1110-2-1601 Hydraulic Design of Flood Control Channels, EM 1110-2-1603 Hydraulic Design of Spillways, and Hydraulic Design Criteria prepared by the U.S. Army Engineer Waterways Experiment Station, CE, Vicksburg, Mississippi. The proposed channel improvements would convey the standard project flood (SPF) from the debris basin at the confluence of Wiley and Towsley Canyons downstream approximately 2.5 miles to Orchard Village Road. The SPF peak discharge would increase from 6,000 cubic feet per second (cfs) at the debris basin to 13,000 cfs at the downstream end of the project.

1.02 Proposed Project. Within the 2.5 miles of project reach, the proposed project would incorporate existing bridges and sections of channel with the following major elements: Inlet structure and debris basin; spillway chute and transition; approximately 7400 feet of rectangular concrete channel; confluence structures at Lyons and Gavin Canyons; various channel transitions structures; improvements to the downstream existing energy dissipator and approximately 3400 feet of existing trapezoidal channel; and construction and/or reconstruction of 7 bridges. (See plates D-1 to D-15).

II. DEBRIS BASIN

2.01 General. Because of the sediment and debris production potential of the Santa Susana Mountains, a debris basin would be required at the upstream end of the concrete-lined channel to insure the functional adequacy of the channel and minimize the scour of the concrete lining resulting from sediment and debris being transported at high velocities. The debris basin would consist of a compacted earth embankment, excavated basin, basin inlet structures, intake tower, pool drain, and spillway structure. (See plate D-2).

2.02 Debris Storage. The criteria for determining the debris volume for the basin is presented in the Hydrology Appendix. From past experience, it has been found that the slope of material deposited after a major flood averages about one-half of the existing streambed slope. The capacity of the debris basin (350,000 cubic yards) was determined by calculating the volume between the excavated invert of the basin and the deposition slope projected upstream from the spillway crest at 0.5 of the natural slope. Excavation in the basin is necessary to provide the required debris volume, and to provide material for the embankment. In order to reduce the frequency of maintenance, material brought in by smaller floods could be stored in the basin, provided that not more than 25 percent of the basin capacity is so utilized.

2.03 Upstream Inlet. A lined inlet structure would be provided at the upstream end of the debris basin in order to control the anticipated degradation upstream from the excavated basin. Specifically, the structure

would stabilize the entire upstream slope face of the basin inlet (approximately 200 feet) with a 3-foot thick grouted rock cover at an invert slope of 1 vertical on 3 horizontal.

2.04 Spillway and Embankment Elevations. The rectangular spillway would be located on the embankment and designed as a broad-crested weir to pass the maximum probable flood (MPF) with a peak of 24,500 cfs. The spillway crest length of 100 feet and the elevation of 1390.0 feet National Geodetic Verdical Datum (NGVD) were found to be the best design based on studies of the relationship of debris storage, embankment height, spillway crest length, and spillway transition length. The spillway rating was determined by assuming critical depth over the crest. The top of the embankment at the spillway crest would be at elevation 1413.0 NGVD and includes a minimum of 3 feet of freeboard.

2.05 Spillway Structure. The spillway structure would consist of a short upstream approach channel, a crest section, and a downstream chute. The approach channel (having an adverse slope of 0.03) would be formed by extending the spillway wall upstream from the crest section. Downstream from the crest section, the spillway channel incorporates a divider wall that allows the walls to diverge at a rate of 1:20. For the initial 350 feet of transition downstream of the spillway crest, the spillway channel was designed to convey the PMF discharge of 24,500 cfs. The remaining portion of the transition channel was designed to convey an SPF discharge of 6,000 cfs. In addition, the entire spillway structure includes a minimum freeboard of 2 feet.

2.06 Pool Drain. The pool drain would consist of an intake tower located upstream of the spillway with the top of the tower approximately one foot above the elevation of the computed debris level at that point; and a 36-inch ungated, reinforced-concrete pipe (RCP) under the embankment with a slope of 0.03, and invert elevation of 1370.00 NGVD feet at the tower and 1358.12 feet NGVD at the downstream end where it would enter the spillway channel. The diameter of the pipe was selected for convenience of maintenance and designed to drain the maximum pool within one day at a maximum discharge of 150 cfs.

III. CHANNELS

3.01 General. The South Fork of the Santa Clara River channel from the downstream end (Station 97+68.98) of the spillway chute to an existing channel at Station 91+77.35 was designed for the SPF peak discharge of 6,000 cfs. Between Station 91+77.35 and Station 87+08.00, the existing channel would be improved to convey 6,000 cfs. This discharge figure increases to 11,000 cfs down to Station 70+97.49. From Station 87+08.36 to Station 85+79.60, the inside channel wall would be removed. Immediately downstream, the reach between Station 85+59.60 and Station 84+76.24 would have the channel walls raised 1.0 foot. From downstream of the Calgrove Boulevard crossing, the existing 38-foot wide channel would be removed and replaced with a triple 12-foot wide channel section. This improved reach would extend from Station 83+60.71 to Station 78+23.92. At Station 71+61.13 only the right inside wall will

be extended downstream to Station 71+49.50. Starting at Station 70+97.49, the SPF peak discharge increases to 11,500 cfs. This figure governs the design down to Station 56+13.00 at which point it increases to 12,000 cfs. The last change in discharge for the concrete rectangular section channel comes at Station 44+16.31. At this particular location, Lyons Channel joins with South Fork increasing the South Fork discharge from 12,000 cfs to 13,000 cfs. The rectangular concrete channel transitions to an existing energy dissipator section at Station 9+90 and then to an existing soft-bottom trapezoidal channel at Station 7+41.00 and remains as such to the end of the project at Orchard Village Road. Finally, in order to introduce an existing Lyon Canyon Channel into the South Fork channel, it was necessary to incorporate a design for a trapezoidal concrete transition structure and a rectangular concrete channel section over an approximate reach length of 530 feet. The design for Lyons Channel was based on an SPF discharge of 2500 cfs. Elements pertaining to the hydraulic design of both channels are discussed in the following paragraphs. (Also, reference Plates D-3 to D-14).

3.02 Bridges. New bridges would replace the existing dip crossings at Atwood Boulevard and DeWolfe Street (Stations 31+20 and 34+76, respectively) on South Fork. In addition, a reinforced concrete box (RCB) bridge would be built just below the debris basin spillway (Station 97+41) while the existing triple box culvert at Calgrove Boulevard (Station 84+18) would be modified by raising the top slab. On Lyon Canyon, a trailer park RCB bridge will be constructed at Station 48+10 W. The project includes two bridges being funded by the Los Angeles County Flood Control District (LACFCD) along a new alinement of Wiley Canyon Road; one over the South Fork (Station 49+15) and one upstream from the confluence with Lyon Canyon Drain (Station 46+75 W). The two bridges will be included in the construction contract. All new bridges along the proposed project would be clear span structures. The existing culvert at Everett Drive and Wiley Canyon Road would remain as is. The culverts are 17 feet high by 30 feet wide and 14.5 feet high by 28 feet wide, and have a present capacity of over 13,000 cfs including a minimum of 2 feet of freeboard.

In order to increase the effective flow conveyance characteristics of the South Fork channel in the vicinity of the Golden State Interstate 5 freeway triple RCB culvert, it would be necessary to both add and raise the existing floodwalls upstream and downstream of the culvert. Specifically, immediately upstream of the culvert, the existing 38-foot wide channel would be converted and improved into three 12-foot wide rectangular concrete channels. This would be done by adding 2 inside walls and raising the outside channel walls. The wall improvements would extend from Station 79+00 to Station 84+76 (or upstream end of Calgrove culvert). Downstream of the freeway only the right inside wall would be extended from Station 71+74.64 to Station 71+63.00. In order to convey the design discharge of 11,000 cfs, with the required 2 feet of freeboard within the existing triple RCB, the LACFCD would refinish the face of the existing channel wall and invert in order to obtain a smooth surface and institute operations and maintenance measures to insure that a Manning's "n" value of 0.013 is maintained for the contact surface.

3.03 Channel Alinement. The proposed channel would follow generally along the alinement of the existing channel. The Los Angeles County Flood Control District set the final alinement. The centerline alinement of the proposed concrete channel would have eight circular curves with spiral lengths from 87.5 to 116 feet long at both ends of each curve. The deflection angles would range from 21°37'42" to 96°42'17" and the radii would range from 330 to 725 feet.

3.04 Gradient. Invert grades were selected to avoid excessive channel excavation and to maintain stable supercritical flow upstream of the energy dissipator. The invert grades of the proposed rectangular concrete channels would range from a maximum of 0.0380 to a minimum of 0.00500. The general grade is 0.01100.

3.05 Freeboard. A minimum freeboard of 2.0 feet would be used throughout the project for the concrete rectangular sections while 2.5 feet would be used for the soft-bottom trapezoidal channel. The freeboard was measured above the computed water surface elevation which includes superelevation and air entrainment adjustments. For supercritical flow, the effect of air entrainment on the depth of flow was determined from plate 45b of EM 1110-2-1602. The impact of the air entrainment varied from almost no effect to 0.3 feet.

3.06 Side Drainage. With the exception of the block wall sections in the existing soft bottom trapezoidal channel reach, the entire channel is fully entrenched, and grated or flared inlets would be provided for drainage of lower lying areas within the proposed channel right-of-way. However, any major side drainage would be conveyed to the main channel through comprehensive existing or future storm drains and open channels.

Block wall extensions varying in height from 0.5 to 4.0 feet would be incorporated in various sections of the existing soft-bottom trapezoidal channel reach in order to convey the SPF design discharge of 13,000 cfs while maintaining a minimum freeboard of 2.5 feet. In order to alleviate localized side drainage behind the walls, 8 inch by 12 inch openings would be located at the base of the walls on an approximate spacing of 150 feet.

3.07 Water Surface Computations. Water surface computations were determined by the reach method using the Manning formula. For the South Fork of the Santa Clara River, the computations were carried from the debris spillway downstream through the existing concrete channel, then through the proposed concrete channel, and finally through the existing soft bottom channel down to Orchard Village Road. Water surface computations for Lyon Canyon channel was also performed by the reach method. For the proposed reinforced concrete rectangular channel, a value of 0.014 for Manning's "n" was chosen for determination of water surface elevations and design velocities. For the trapezoidal section, a value of 0.030 for Manning's "n" was used for determination of water surface elevations and design velocities. Flow could be supercritical throughout the length of the proposed channel. Flow would be subcritical in the existing reach of trapezoidal channel. The ranges of channel velocities and depths in the various reaches are given in table 1.

TABLE 1

PROPOSED CHANNEL DEPTHS AND VELOCITIES

Station	Width (ft)	Depth Minimum (ft)	Depth Maximum (ft)	Velocity Minimum (fps)	Velocity Maximum (fps)	Wall Heights Minimum (ft)	Wall Heights Maximum (ft)
97+68.98–91+77.35	25	6.4	7.4	32.4	37.5	9.012.0	
71+74.64–55+40.00	38	8.5	10.1	30.1	35.6	10.012.0	
53+90.00–32+60.00	28	11.0	12.9	33.2	40.4	14.015.0	
32+40.00–11+92.46	30	11.0	12.9	33.6	40.3	13.515.5	

3.08 Wall Heights. The walls range in height from 9.0 to 15.5 feet (see table 1). Wall heights were determined by the addition of air entrainment and freeboard to the depth of flow.

3.09 Structures Downstream of Lyons Avenue. The lower reach of the South Fork of the Santa Clara River, from Lyons Avenue to Orchard Village Road, has been improved by local interests. It includes an energy dissipator and a 140-foot-wide leveed trapezoidal earth-bottom channel. The existing energy dissipator contains 36 rows of baffle blocks one foot high by two feet wide. The dissipator was designed to induce a hydraulic jump to discharges up to 10,450 cfs. For the dissipator to function properly under the new discharge of 13,000 cfs the baffle blocks would have to be enlarged as shown in plates D-10 and D-14. All baffle blocks would be two feet wide. The first twelve rows of baffle blocks would be 2 feet high, the second 12 rows would be 2.75 feet high and the remaining 12 rows would be 3.50 feet high. The trapezoidal channel currently has side slopes lined with concrete to a depth of 5 feet below the invert and includes 5 vertical drop structures. The approximate length of the channel is about 3800 feet (see plates D-10 to D-13). However, in order to insure the full containment of the SPF peak discharge, the trapezoidal channel would be modified by adding, at selected required sections, a parapet type block wall to the existing channel banks.

3.10 Sediment. The major source of debris and sediment production is controlled by the proposed debris basin at the confluence of Wiley and Towsley Canyons. Further, relatively small amounts of sediment material, would enter the channel system from the uncontrolled sources of Gavin and Lyon Canyons and their effect in terms of wear to the concrete channel surface would be minimal.

In assessing the impact on the downstream existing trapezoidal channel, calculations for sediment carrying capacity were performed using the Einstein-Brown equation for sediment transport. Bed material samples were taken from the river bed at 5 locations in the soft-bottom trapezoidal channel reach. The median size of the five samples varied from 2 mm in the upstream area of the soft-bottom channel reach to 1 mm in the downstream area of the soft-bottom channel reach. The unit sediment discharges were found to vary from 1000 lb/sec-ft at the upstream portion of the soft-bottom reach to 3000 lb/sec-ft at the downstream portion of the soft-bottom reach. Channel velocities throughout the proposed project are sufficiently high to transport all the sediment delivered to it. In addition, the existing trapezoidal channel was checked for one additional case, that of clear water flow. Under this condition, the channel invert would reach an equilibrium slope of about 0.005. The existing drop structures in this reach of channel would still function under this condition without undermining. However, a condition of no sediment reaching the existing trapezoidal channel is very unlikely. A more likely condition would be somewhere between the two conditions that were considered. Since the channel could function satisfactorily under either extreme, it would also function satisfactorily at any condition between the extremes.

IV. CONFLUENCES

4.01 General. The project includes an existing South Fork confluence with Gavin Canyon channel, which is about 1000 feet upstream of the Interstate 5 freeway, and a proposed South Fork confluence with Lyon Canyon channel. The proposed Lyon Canyon confluence is located just upstream of Wiley Canyon Road. (See plates D-4 and D-14).

4.02 Confluence With Gavin Canyon. The existing South Fork confluence with Gavin Canyon channel consists of the merging of two rectangular concrete channels. The South Fork channel is 21 feet wide and Gavin Canyon channel is 18 feet wide. Hydraulic calculations indicate that subsequent to the raising of the outside walls 1.0 foot, the South Fork and Gavin Canyon channels would then be adequately sized to convey the design discharges of 6000 and 5000 cfs, respectively. Further, in order to improve the hydraulic performance of the confluence for a better mixing of the flows, it would be necessary to lengthen the confluence by removing about 130 feet of the downstream end of the inside wall. (See plate D-4).

4.03 Confluence With Lyon Canyon. The confluence of the South Fork and Lyon Canyon channels would incorporate 375 feet of channel and an approach chute to accelerate the flows from Lyon Canyon. The main channel section upstream would be 16 feet wide and the connecting section from Lyon Canyon drain would be 9 feet wide with a confluence angle of 11 degrees. Downstream from the transition, the channel would be 28 feet wide. The transition is designed for 11,500 cfs entering from the South Fork and the contemporaneous flow of 1500 cfs entering from Lyon Canyon drain for a total of 13,000 cfs. (See plates D-7, D-8, and D-14).

STRUCTURAL DESIGN

General. This section presents the feature design for the structural elements of the proposed flood control plan. The structural elements for this project include rectangular reinforced concrete spillway and channel walls, and reinforced concrete intake tower and outlet pipe at the debris basin.

References. All structures would be designed in accordance with applicable provisions of the following Engineering Manuals for Civil Works construction.

Reference	Date	Title
EM 1110-1-2101	November 1, 1963	Working Stresses for Structural Design
EM 1110-2-2103	May 21, 1971	Details of Reinforcement-Hydraulic Structures
EM 1110-2-2502	May 29, 1961	Retaining Walls
EM 1110-2-2902	March 3, 1969	Conduits, Culverts, and Pipes
EM 1110-2-2400	November 2, 1964	Spillways and Outlet Works

Unit Design Stresses. Pertinent information on Unit Design Stresses used in the design of the proposed improvements is given in the following table.

TABLE 2

UNIT DESIGN STRESSES

Concrete:

Ultimate compressive strength	
Cast-in-place structures other than culverts	f'c = 3,000 psi
Culverts and conduits	f'c = 4,000 psi
Allowable compressive strength	
Flexure for retaining walls	fc = 0.35 f'c = 1,050 psi
Flexure for culverts and conduits	fc = 0.45 f'c = 1,800 psi
Shear	60 psi for f'c = 3,000 psi 70 psi for f'c = 4,000 psi
Ratio $n = \frac{Es}{Ec}$	n = 9.3 for f'c = 3,000 psi n = 8.0 for f'c = 4,000 psi
Modulus of elasticity	Ec = 3,122,000 psi for f'c = 3,000 psi Ec = 3,605,000 psi for f'c = 4,000 psi
Bond, deformed bars (U)	
Top bars $3.4\sqrt{f'c/D}$	350 Max. psi
Other bars $4.8\sqrt{f'c/D}$	500 Max. psi

Reinforcing Steel, Grade 40:

Allowable tensile strength	fs = 20,000 psi
Modulus of elasticity (Steel)	Es = 29,000,000 psi

Weights and Properties:

Concrete weight	150 lbs. per cu-ft.
Water weight	62.5 lbs. per cu-ft.

The weights and properties of soils are given in Appendix C titled "Geology, Soils and Materials."

Debris Basin. Structural design criteria for various elements of the basin, is described in the following paragraphs.

a. Intake Tower. The wall thickness would be determined from a stress analysis by applying the differential head of water between the inside and outside of the tower. In the determination of stability, the design load and buoyancy of the structure as well as seismic forces would be considered. The tower would be supported by a spread footing which would be designed so that the resultant of the vertical and horizontal loads would fall within the middle third of the footing. When the seismic forces are considered, the resultant would be designed to fall within the middle half. The tower would be checked for two loading conditions: Condition I, when the reservoir is empty with seismic loading (seismic zone 4) and Condition II, when the reservoir is full to spillway crest elevation with no seismic loading. The possibility of an earthquake occurring simultaneous with Condition II is remote; therefore such a condition will be disregarded.

b. Reinforced Concrete Outlet Pipe. The 36-inch RCP under the embankment would be designed for Condition I (i.e., when the debris basin is empty) and Condition II (i.e., when the debris basin is full). Condition I loading would be as follows: (a) the vertical pressure equals 1.5 times the height of the fill times unit weight of the embankment and (b) the horizontal pressure equals 0.5 times the height of the fill times the unit weight of the embankment. The pipe would be designed for earthfill plus highway loading equivalent to HS 20-44 design loading to protect against damage from construction equipment. For Condition II loading, the water pressure over the conduit on the upstream side of the embankment would be considered. Reinforced concrete pipe would be encased in concrete. The design loads would be determined in accordance with EM 1110-2-2902 and a Safety Factor of 2.0 would be used. All pipe joints under the embankment of the debris basin shall be steel bell and spigot with gasket.

c. Spillway Wall.

(1) Spillway Approach Walls. The walls upstream from the axis of the embankment would be divided into 3 sections "A", "B", and "C" of more or less equal lengths, depending on the amount of fill behind the wall. The "A" section at the entrance to the spillway would be designed for 5 loading conditions: Condition I, saturated backfill and an empty channel with a 1/3 increase in allowable stresses due to rapid drawdown; Condition II, drained backfill with an empty channel and normal stresses; Condition III, drained backfill plus construction equipment surcharge load with an empty channel. The allowable concrete and steel stresses of 25 percent above normal would be used for this condition; Condition IV, channel is full with passive pressure due to backfill counteracting the hydrostatic force in the channel. Condition V, loading assumes a free standing wall with a seismic force of 0.2g applies in either direction. An increase in allowable stresses of 33 percent would be included for this condition.

The design of Sections "B" and "C" would be the same as above, except that Condition V would be omitted. Minimum channel face vertical reinforcing steel would be determined by one of the criteria as follows: (a) No. 4 bars spaced

at 2 feet on centers, (b) 10 percent of the vertical steel in the earth face of the wall, (c) steel as required by Condition IV or V, whichever is greater.

(2) Spillway Chute Walls. The walls downstream from the axis of embankment are assumed to be outside of the zone of saturation; therefore, only drained earth backfill would be considered. The loading conditions for chute walls would be as given in paragraph (1) above; however, only Conditions II, III, and IV would be used.

A subdrainage system with perforated pipes would be provided.

Rectangular Channel. The walls of the open rectangular reinforced concrete channel would be designed as L-Type or U-Type retaining walls. Both L-walls and U-walls would be designed for two loading conditions: Condition I (i.e., when the channel is empty), and Condition II (i.e. when the channel is full). For Condition I loading, earth pressure on the back of the wall would be determined in accordance with criteria contained in Civil Works Engineer Letter 64-7, 22 April 1964. Subject: "Construction Stresses in Retaining Walls". The lateral earth pressure would be computed for a condition of drained backfill.

The triangle distribution of the horizontal earth pressure would be assumed in the design of the wall stem. Besides the earth pressure, a maximum loading of 200 psf due to construction equipment would be applied at the top of the wall; the loading would be decreased by unit lateral earth pressure Kw at each foot of depth. The allowable stresses for concrete and steel under this loading condition would be increased by 25 percent. Friction with a coefficient equal to the tangent of 3/4 ϕ (internal friction angle of the backfill material) would be assumed to act on the back of the walls. Straight-line distribution of soil pressure would be assumed in the design of the wall footing. For Condition II loading, the hydrostatic pressure of 62.5 pounds per cubic foot on the channel face of the wall would be balanced by the passive lateral earth pressure acting on the back of the wall. Vertical reinforcing steel in the channel face of the wall would consist of either reinforcing bars 1/2-inch in diameter and spaced on 18-inch centers or reinforcing bars comprising 10 percent of the vertical steel in the back of the wall, whichever gives the greater area of steel.

Confluences. All confluences would be designed for their respective differential head of water pressure against the common wall between the two channels.

Side Drainage Structures. Various sizes of drainage pipes would be provided to connect existing drainage facilities into proposed channel improvements. Automatic drainage gates would be provided wherever required.

Bridges. Bridges within the public road right-of-way would be designed by local interests in accordance with applicable standards of the American Association of State Highway and Transportation Officials. Other bridges would be designed as a single-barrel covered channel.

The single-barrel covered section would be a reinforced concrete box designed to carry vertical earth loads, lateral earth pressures, hydrostatic pressures, foundation pressure, and live loads. The live specifications would be for HS 20-44 design loading. Axial forces caused by vertical load and horizontal earth pressures would be considered in the design.

BRIDGES AND UTILITY RELOCATIONS

DeWolfe Road Bridge

The DeWolfe Road bridge at approximately station 34+76 would have a width of 50 feet along the channel center line, the clear span length would be 28 feet and the height would be 14 feet.

Atwood Boulevard Bridge

The Atwood Boulevard bridge at approximately station 31+20 would have a width of 50 feet along the channel center line, the clear span length would be 30 feet, and the height would be 13.5 feet.

Wiley Canyon Road Bridge

a. The existing Wiley Canyon bridge at approximately station 43+60 is to remain in place. No modification work would be required.

b. A new bridge over South Fork Channel at approximately station 49+15 would have a width of 340 feet along the channel center line, the clear span length would be 28 feet, and the height would be 14.5 feet.

c. A new bridge over Lyon Channel at approximately station 46+75W would have a width of 100 feet along the channel center line, the clear span length would be 9 feet and the height would be 12 feet.

Calgrove Boulevard Bridge

The existing Calgrove Boulevard Bridge at approximately station 84+18 would be modified by reconstructing the top slab and an invert overlay at the existing triple-barrel box that is 12 feet high by 12 feet wide in each barrel.

Trailer Park Bridge

A Trailer Park Bridge over Lyon Channel at approximately station 48+10W would have a width of 20 feet along the channel center line, the clear span length would be 16 feet and the height would be 8 feet.

Access Road Bridge

An Access Road Bridge below Debris Basin Spillway at approximately station 97+41 would have a width of 55 feet along the channel centerline, the clear span length would be 25 feet and the height would be 10 feet.

Utility Relocations

Utility relocations would consist of the relocation or modification of existing gas, water, sewer, power, and oil lines. The relocations involved for the utilities listed are routine and do not present any unusual problems that would necessitate a change in the alinement, profile, or cross section of

the channel. The relocation of existing utilities would be coordinated with the local agencies to avoid unnecessary delay in the construction of the channel. Pertinent information on utilities is given in table 3.

TABLE 3

UTILITIES CROSSING SOUTH FORK OF THE SANTA CLARA RIVER

Gas Lines

Approximate Location	Description	Owner
Station 19+63	2" Main Line	So. California Gas Co.
Station 27+54	2" Main Line	So. California Gas Co.
Station 31+19	2" Main Line	So. California Gas Co.
Station 34+65	2" Main Line	So. California Gas Co.
Station 43+44	2" Main Line	So. California Gas Co.
Station 43+77	2" Main Line	So. California Gas Co.
Towsley D.B.	4" Gas Line	So. California Gas Co.

Water Lines

Approximate Location	Description	Owner
Station 19+62	*6" ACP crosses under existing channel @ 3' to 4' depth encased in concrete	Santa Clarita Water Co.
Station 27+84	*6" ACP crosses over existing channel box	Santa Clarita Water Co.
Station 28+87	*6" ACP crosses over existing channel box	Santa Clarita Water Co.
Station 31+52	*8" ACP crosses under @ 3' to 4' depth encased in concrete	Santa Clarita Water Co.
Station 35+05	*6" ACP crosses under existing channel @ 3' to 4' depth encased in concrete	Santa Clarita Water Co.
Station 43+98	*6" ACP crosses over existing channel box	Santa Clarita Water Co.
Station 48+10W	6" water line in Trailer Park	Santa Clarita Water Co.
Station 84+00	8" water line at Calgrove Blvd.	Santa Clarita Water Co.
Towsley D.B.	6" water line	Santa Clarita Water Co.

TABLE 3. (Continued)

Sewer Lines		
Awaiting input from the Los Angeles County Sanitation District.		
Station 48+20W	6" sanitary sewer at Trailer Park	
Power Facilities		
Station 27+30	Pole	So. California Edison Co.
Oil Lines		
Station 43+90	2" Oil line	Chevron U.S.A., Inc.

*Asphalt concrete pipe.

SCHEDULE FOR DESIGN AND CONSTRUCTION

The time required to prepare the plans and specifications for this project is approximately three months. This phase of the project has been accelerated due to a desire on the part of the local sponsor, the Los Angeles County Flood Control District, to begin construction in FY 85, pending approval of this Supplemental Report and receipt of funds.

To meet this schedule, the Los Angeles County Flood Control District has agreed to prepare the plans. The plans and specifications would be prepared concurrent to the review of this Supplemental Report.

Construction would take about 18 months to complete, and would be mainly accomplished when rain is not a major problem.

COST ESTIMATES

General. Total estimated cost for the project as recommended in this report is $11,391,000 of which $4,000,000 is a Federal cost and $7,391,000 is a non-Federal cost. The detailed estimated costs for the project based on August 1984 price levels is shown in table 5. Unit prices are based on costs prevailing in August 1984 for work of this nature in the Los Angeles area and in the vicinity of the site. A summary of the detailed estimate of first costs for the selected plan of improvement is given in table 4. The cost estimate for the proposed improvements includes construction, engineering and design, supervision and administration, right-of-way, and contingencies.

TABLE 4

SUMMARY OF ESTIMATED FIRST COSTS
UNDER THE SELECTED PLAN
(August 1984 price levels)

Cost Acct. No.	Item	Amount
06	Fish and Wildlife Facilities	102,000
09	Channel & Debris Basin	7,355,000
20	Reservoir Staff Gages	1,000
30	Engineering and Design	310,000
31	Supervision and Administration	447,000
	Subtotal, Construction Cost	$8,215,000
01	Lands and Damages	1,566,000
02	Relocations	1,150,000
	TOTAL PROJECT FIRST COSTS	$10,931,000
30	Detailed Project Report	460,000
	TOTAL FLOOD CONTROL COSTS	$11,391,000
	FEDERAL COST	$4,000,000
	NON-FEDERAL COST	$7,391,000
Annual Operation and Maintenance Cost		$ 85,000

TABLE 5

DETAILED FIRST COST ESTIMATE FOR IMPROVEMENT
UNDER THE SELECTED PLAN
(August 1984 price levels)

Cost Acct. No.	Description	Quantity	Unit	Unit Cost	Amount
06	Fish and Wildlife Facilities:				
	Mitigation Area:	1	Job	LS	89,000
	Contingencies (15%)				13,000
	Total, Fish and Wildlife Facilities				$102,000
09	Channel & Debris Basin				
	DEBRIS BASIN				
	Care and diversion of water	1	Job	LS	15,000
	Clearing and grubbing	16	AC	2,000	32,000
	Excavation, debris basin	174,000	CY	3.00	522,000
	Excavation, foundation	53,000	CY	3.50	185,500
	Excavation, abutment	1	Job	LS	20,000
	Compacted fill, random	182,000	CY	3.00	546,000
	Drain material	6,000	CY	12.00	72,000
	Aggregate base course	250	CY	20.00	5,000
	A.C. paving	240	Ton	45.00	10,800
	Grouted stone inlet	1	Job	LS	46,000
	Concrete facing slab	1	Job	LS	220,000
	Gutters	1	Job	LS	17,000
	Access road:				
	Compacted fill	25,000	CY	2.40	60,000
	Aggregate base course	540	CY	20.00	10,800
	A.C. paving	530	Ton	45.00	23,850
	5-foot chain link fence	2,100	LF	7.00	14,700
	Culverts	1	Job	LS	10,000
	Spillway:				
	Excavation	13,700	CY	3.00	41,100
	Compacted fill	2,900	CY	3.00	8,700
	Concrete, cutoff wall	10	CY	150.00	1,500
	Concrete, invert	1,300	CY	105.00	136,500
	Concrete, wall	370	CY	150.00	55,500
	Cement	9,500	CWT	4.60	43,700
	Reinforcing steel	225,000	LB	0.50	112,500
	Fencing (4-foot)	1,050	LF	6.00	6,300
	Subdrainage	1	Job	LS	20,000

TABLE 5. (Continued)

Cost Acct. No.	Description	Quantity	Unit	Unit Cost	Amount
	Intake tower and drain pipe:				
	Intake tower	1	Job	LS	17,000
	Excavation	700	CY	3.00	2,100
	Compacted fill	600	CY	3.00	1,800
	36" R.C.P.	360	LF	60.00	21,600
	Concrete, cradle	350	CY	190.00	66,500
	Cement	2,000	CWT	4.60	9,200
	Reinforcing steel	53,000	LB	0.50	26,500
	CHANNEL				
	Clear and grub	7	AC	2,500	17,500
	Diversion and control of water	1	Job	LS	30,000
	Earthwork				
	Excavation	118,000	CY	3.50	413,000
	Compacted fill, channel	66,000	CY	3.00	198,000
	Misc. fill, channel	6,900	CY	2.00	13,800
	Concrete				
	Invert, channel	3,100	CY	105.00	325,500
	Footings, channel	3,600	CY	110.00	396,000
	Walls, channel	5,400	CY	150.00	810,000
	Cement	69,000	CWT	4.60	317,400
	Reinforcing steel	2,150,000	Lbs	0.40	860,000
	4-foot chain link fence, channel	11,200	LF	6.00	67,200
	Access road:				
	Compacted fill	3,000	CY	2.00	6,000
	Aggregate base course	2,100	CY	20.00	42,000
	A.C. paving	2,000	Ton	45.00	90,000
	5-foot chain link fence	12,900	LF	7.00	90,300
	Sidedrains	9	Ea	4,000	36,000
	Concrete blockwall	1	Job	LS	110,000
	Shoring	1	Job	LS	100,000
	Baffle Blocks	1	Job	LS	12,000
	Beautification, channel	1	Job	LS	80,000
	Subtotal, channel & debris basin				$6,395,850
	Contingencies (15%)				959,150
	Total, channel & debris basin				$7,355,000
20	Reservoir Staff gages	6	Ea	140.00	840
	Contingencies				160
	Total, Reservoir staff gages				$ 1,000

TABLE 5. (Continued)

Cost Acct. No.	Description	Quantity	Unit	Unit Cost	Amount
30	Engineering and Design				
	Plans and Specifications				260,000*
	Engineering during Construction				50,000
	Total, Engineering & Design				310,000
31	Supervision and Admininstration				447,000
01	Lands and Damages				1,566,000
02	Relocations				
	Bridges				1,050,000
	Utilities				100,000
	Total Relocations, Bridges & Utilities				1,150,000
30	Detailed Project Report				460,000

* L.A. County Flood Control District will prepare the plans.

OPERATION AND MAINTENANCE

The Los Angeles County Flood Control District will operate and maintain the completed facilities. Because maintenance and operation costs are to be projected for 100 years from the completion of the project, maintenance costs would include replacing 3 inches of concrete invert every 25 years as well as periodic removal of debris from debris basin in addition to routine maintenance. Debris removal costs of $5.00 per cubic yard are considered typical. The amount of debris accumulation is estimated to average 8000 cubic yards annually. Based on these figures, an average annual operation and maintenance charge of $85,000 was estimated for the project.

REAL ESTATE REQUIREMENTS

As required by the authorizing legislation, local interest would acquire rights-of-way required for permanent and temporary use during construction of the improvements, and would obtain lands required for borrow or disposal areas.

Construction of the debris basin and channel would require about 49.3 acres of land of which 34 acres would be allocated for the debris basin with the remaining 15.3 acres to be utilized for the channel. In addition, there are improvements currently valued at $14,000 in the debris basin R/W which consist of corrals, feed areas, and a horse training area. Also, 4 acres would be temporarily acquired for construction easements.

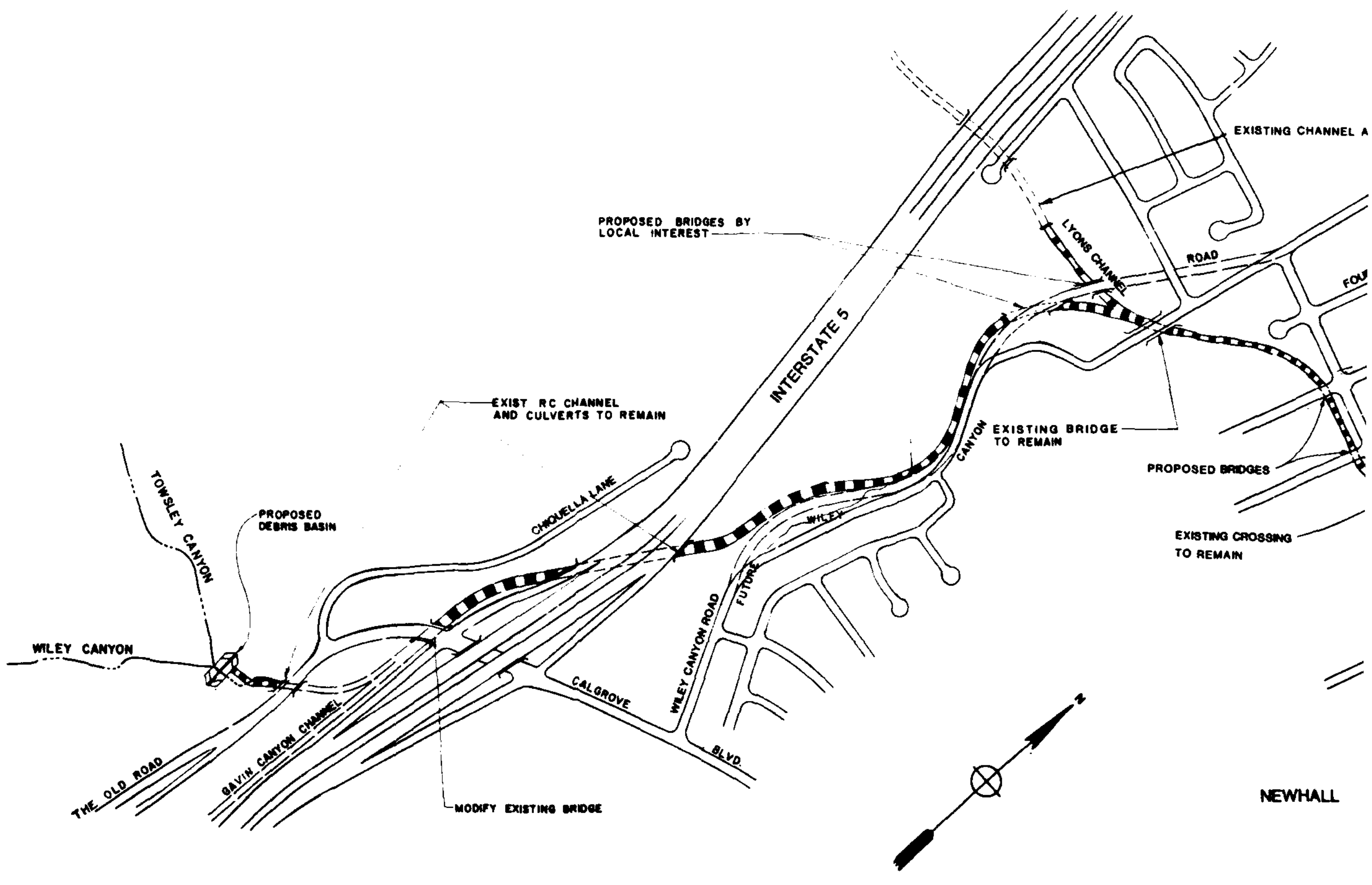
The estimated cost of $1,566,000 is based on preliminary investigation that included inspection of the subject properties and adjacent neighborhoods, discussion with local real estate brokers, and past experience in this area.

TABLE 6

SUMMARY OF REAL ESTATE COSTS
FOR THE SELECTED PLAN

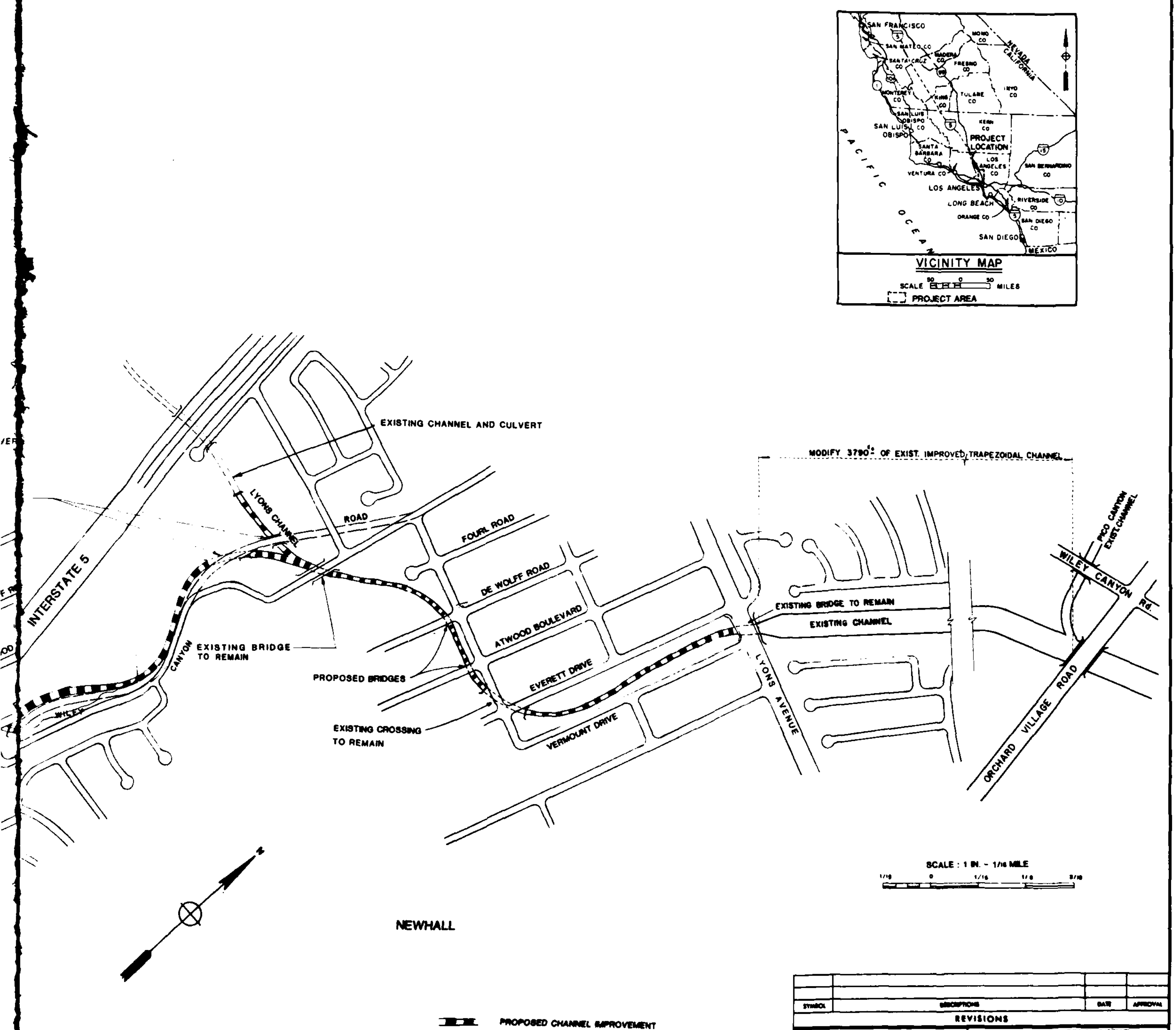
Location	Acreage	Per Acre Fair Market Value	Total FMV
DEBRIS BASIN			
in floodway	6	5,000	30,000
not in floodway	28	40,000	1,120,000
improvements in debris basin R/W	-		14,000
CHANNEL			
in floodway	3.3	5,000	16,500
not in floodway	12.0	30,000	360,000
CONSTRUCTION EASEMENT		---	25,200
		TOTAL	$1,565,700
		SAY	$1,566,000

VALUE ENGINEERING PAYS



SAFETY PAYS

VALUE ENGINEERING PAYS



SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:
DRAWN BY:
CHECKED BY:

LOS ANGELES COUNTY, CALIFORNIA

SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

PROJECT LOCATION

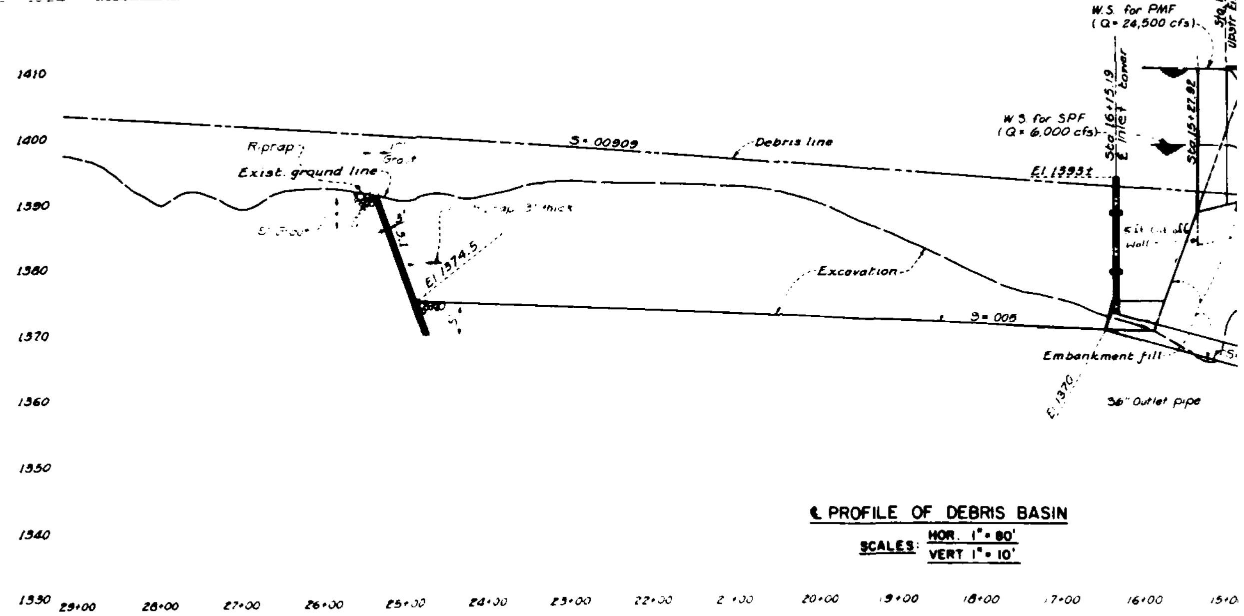
SUBMITTED BY:
DATE APPROVED:
SPEC. NO. DACW09- ____ B- ____
DISTRICT FILE NO.
SHEET 1 OF 15

PLATE D-1

SAFETY PAYS

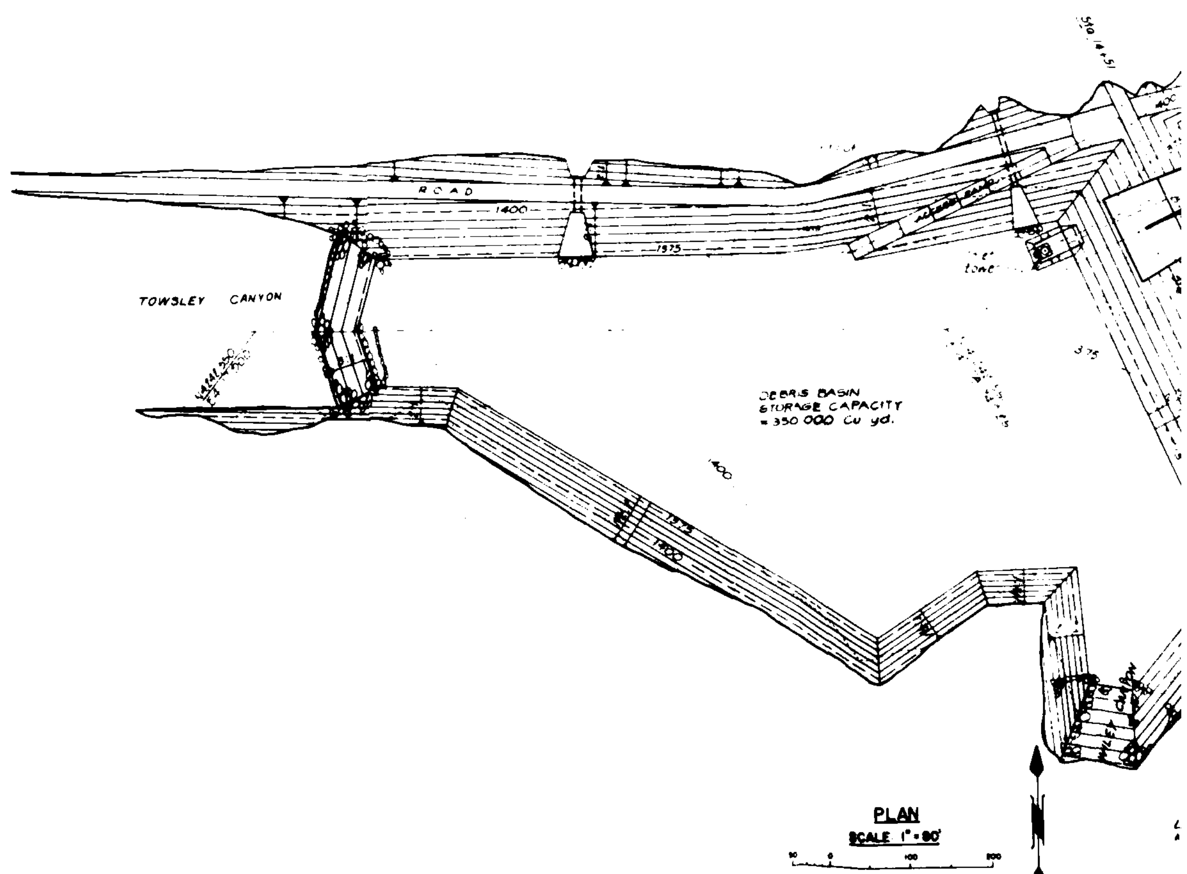
2

STATION	TO STATION	SECTION	HYDRAULIC ELEMENTS SLOPE		Q	D_c UPS	DS	D_n	RANGE	n = .014 VEL	RANGE
14+51	11+01.44	transition	varies	PMF	24,500	12.3	15.9	12.3	7.8	19.9	49.5
14+51	11+01.44	transition	varies	SPF	6000	4.8	6.4	4.8	2.5	2.5	36.9
12+00	9+48.00	ogn spwy tran	.0300	SPF	-	6.4	12.1	2.5	7.0	36.9	34.3



℄ PROFILE OF DEBRIS BASIN

SCALES: HOR. 1" = 80' / VERT 1" = 10'

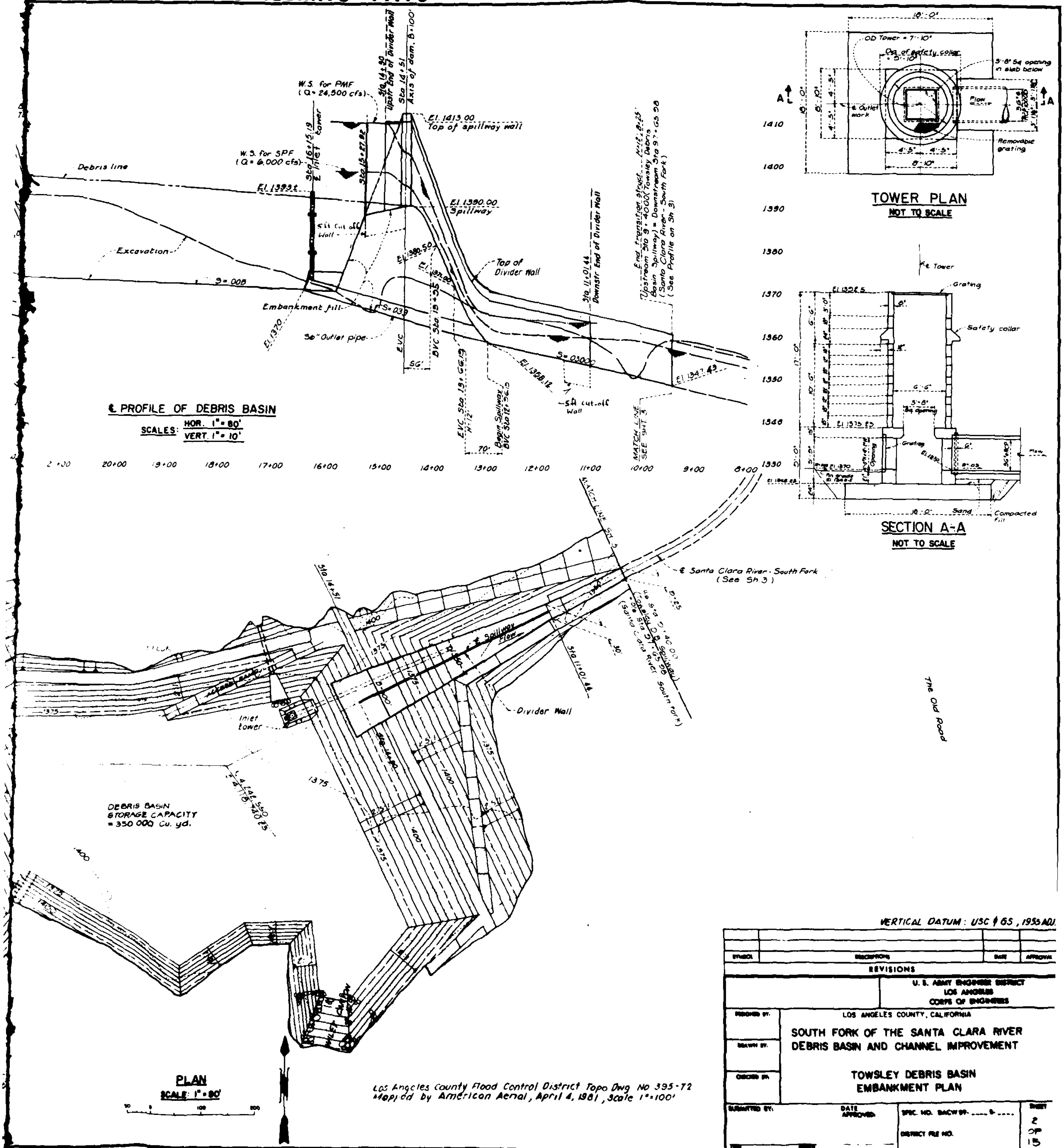


PLAN

SCALE 1" = 80'

SAFETY PAYS

VALUE ENGINEERING PAYS

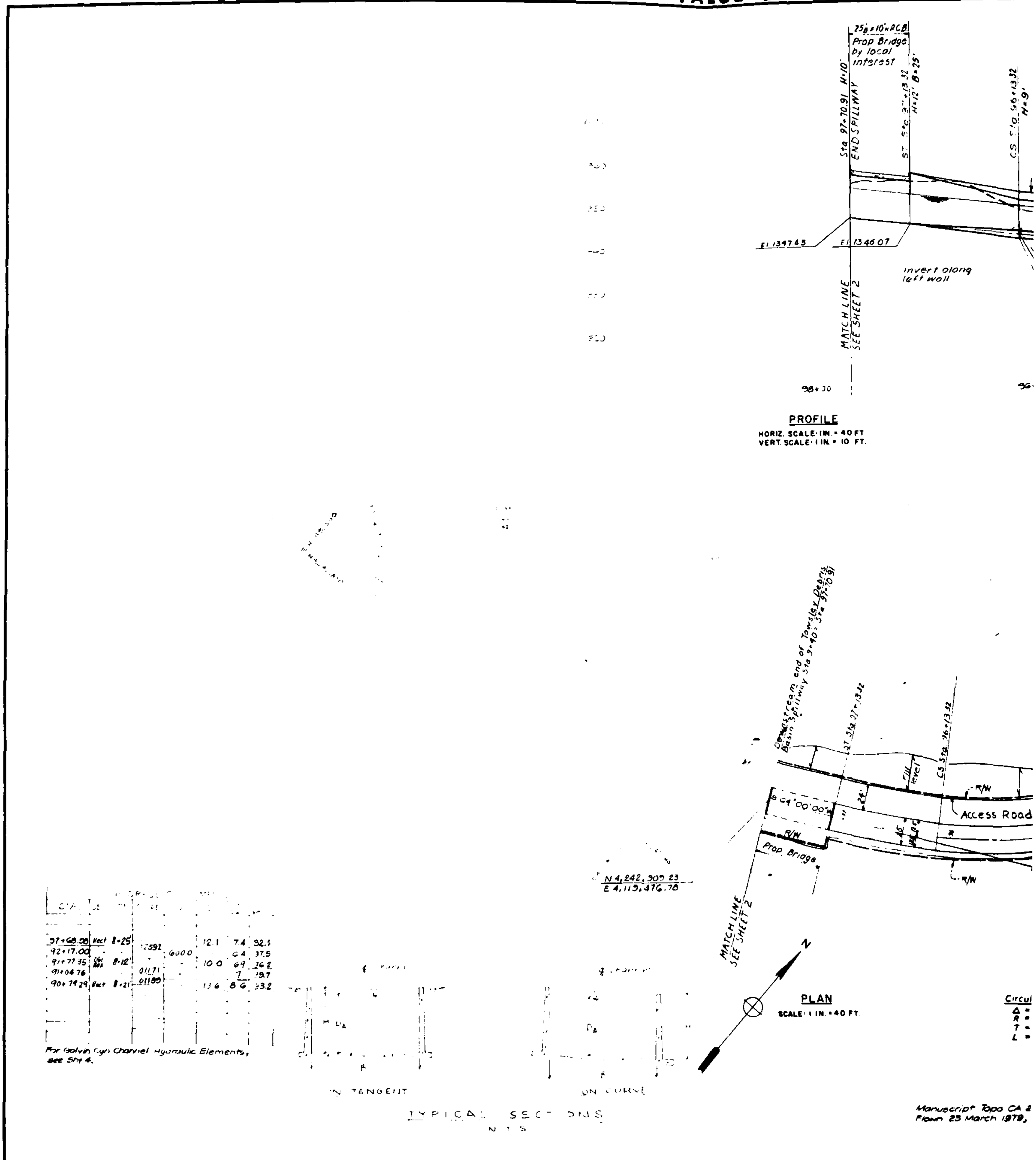


SAFETY PAYS

PLATE D-2

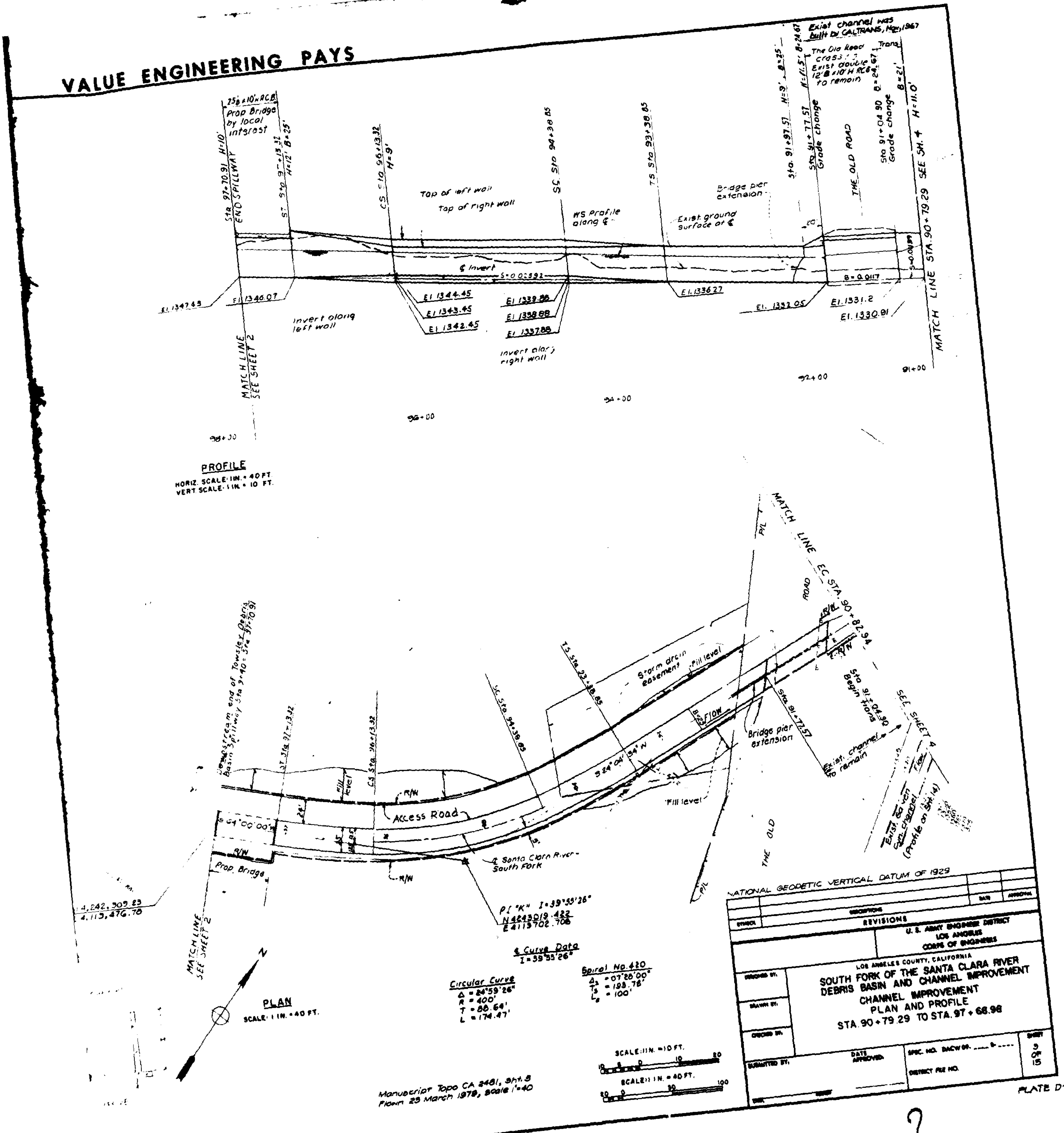
2

VALUE ENGINEERING PAYS



SAFETY PAYS

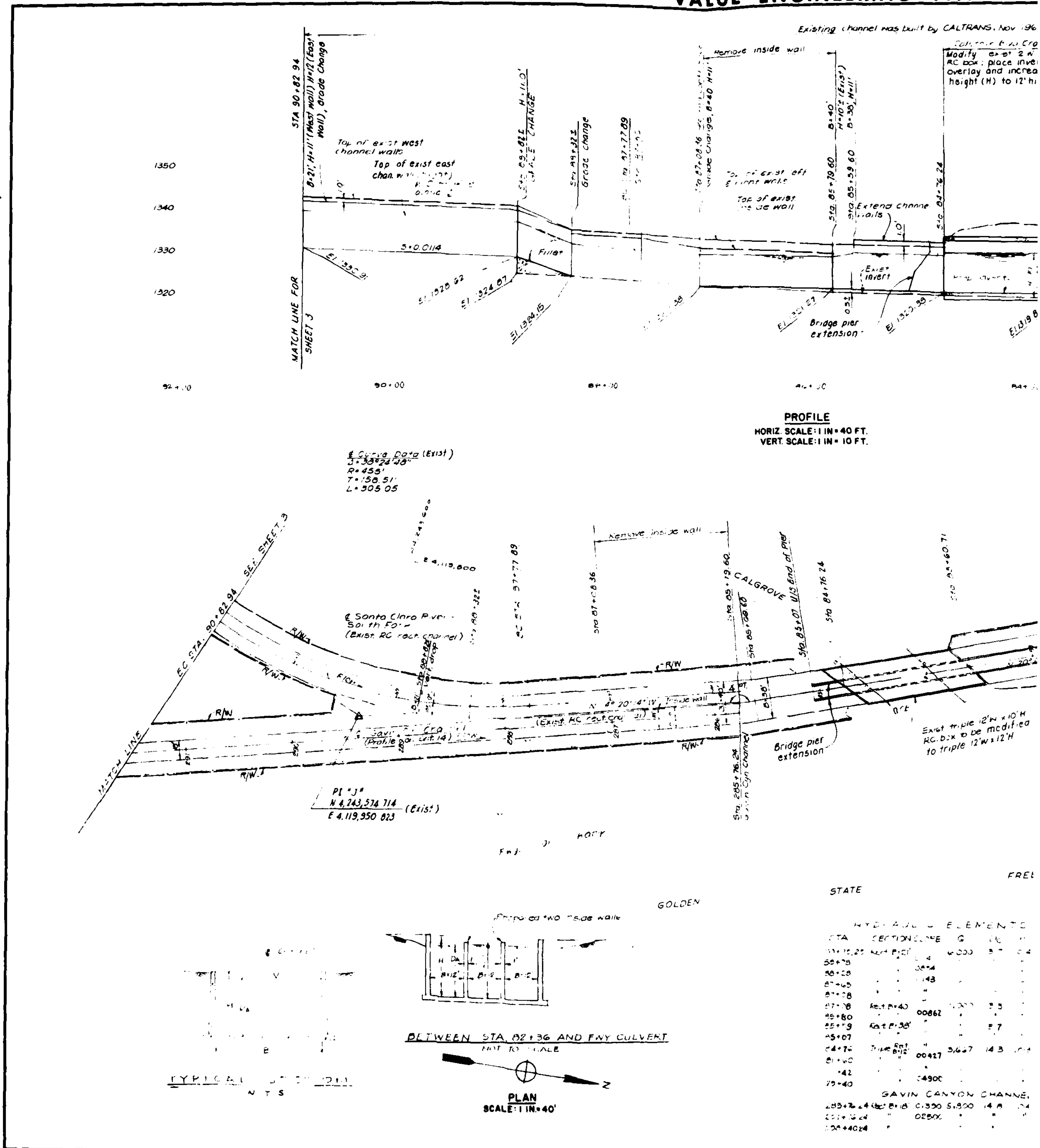
VALUE ENGINEERING PAYS



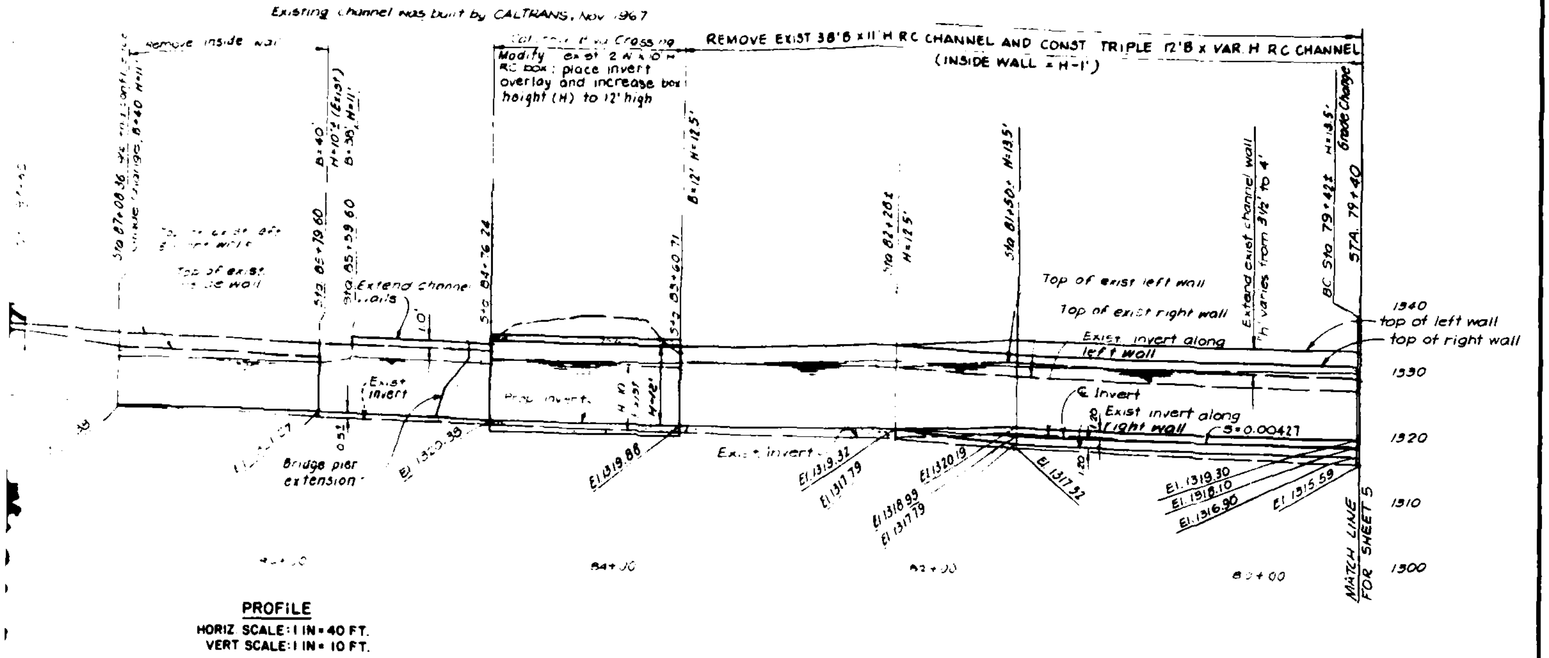
2

SAFETY PAYS

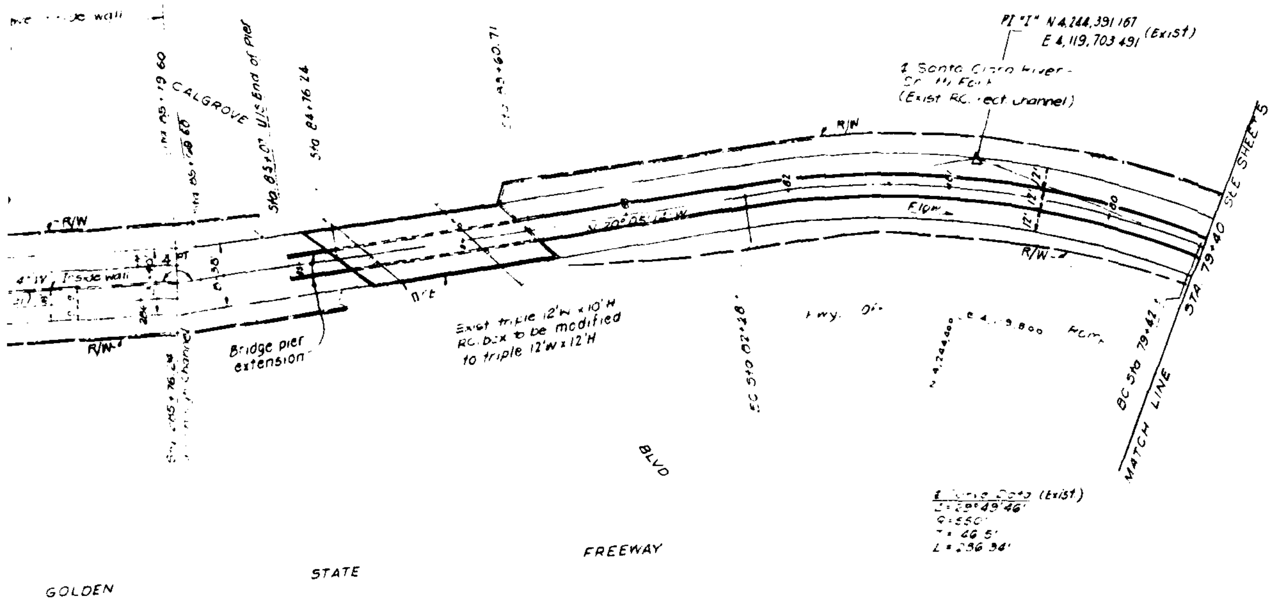
VALUE ENGINEERING PAYS



SAFETY PAYS



PROFILE
HORIZ. SCALE: 1 IN = 40 FT.
VERT. SCALE: 1 IN = 10 FT.



HYDRAULIC ELEMENTS

STA	SECTION	SLOPE	Q	Dc	n	Dn	Vel
[illegible]+15.29	Rect B=21'		6,000	13.7	.014	[illegible]	[illegible]
58+78	"	[illegible]	"	"	"	8.5	[illegible]
48+23	"	.0854	"	"	"	7.8	[illegible]
[illegible]+65	"	.0148	"	"	"	7.8	[illegible]
[illegible]+78	"	"	"	"	"	7.9	36.1
[illegible]+28	Rect B=40		11,000	13.5	"	7.7	35.7
85+80	"	.00862	"	"	"	7.9	35.3
85+59	Rect B=38'	"	"	13.7	"	8.4	34.5
85+07	"	"	"	"	"	8.6	33.1
84+76	Triple Rect B=12'	"	3,667	14.3	.013	9.4	32.5
81+60	"	.00427	"	"		10.3	29.7
+42	"	"	"	"	"	11.7	26.1
79+40	"	.04900	"	"	"	11.2	27.3
GAVIN CANYON CHANNEL							
285+76.24	Rect B=18'	.01330	5,800	14.8	.014	9.0	35.8
[illegible]+16.24	"	.02500	"	"	"	8.8	36.6
290+40.24	"		"	"	"	–	–

Manuscript Topo Co. 2481, Sht 9
Flown 23 March 1979 Scale 1"=40'

SCALE: 1 IN. = 10 FT.
10 0 10 20

SCALE: 1 IN. = 40 FT.
40 0 50 100

NATIONAL GEODETIC VERTICAL DATUM OF 1929

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
REVISIONS			

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY
DRAWN BY
CHECKED BY

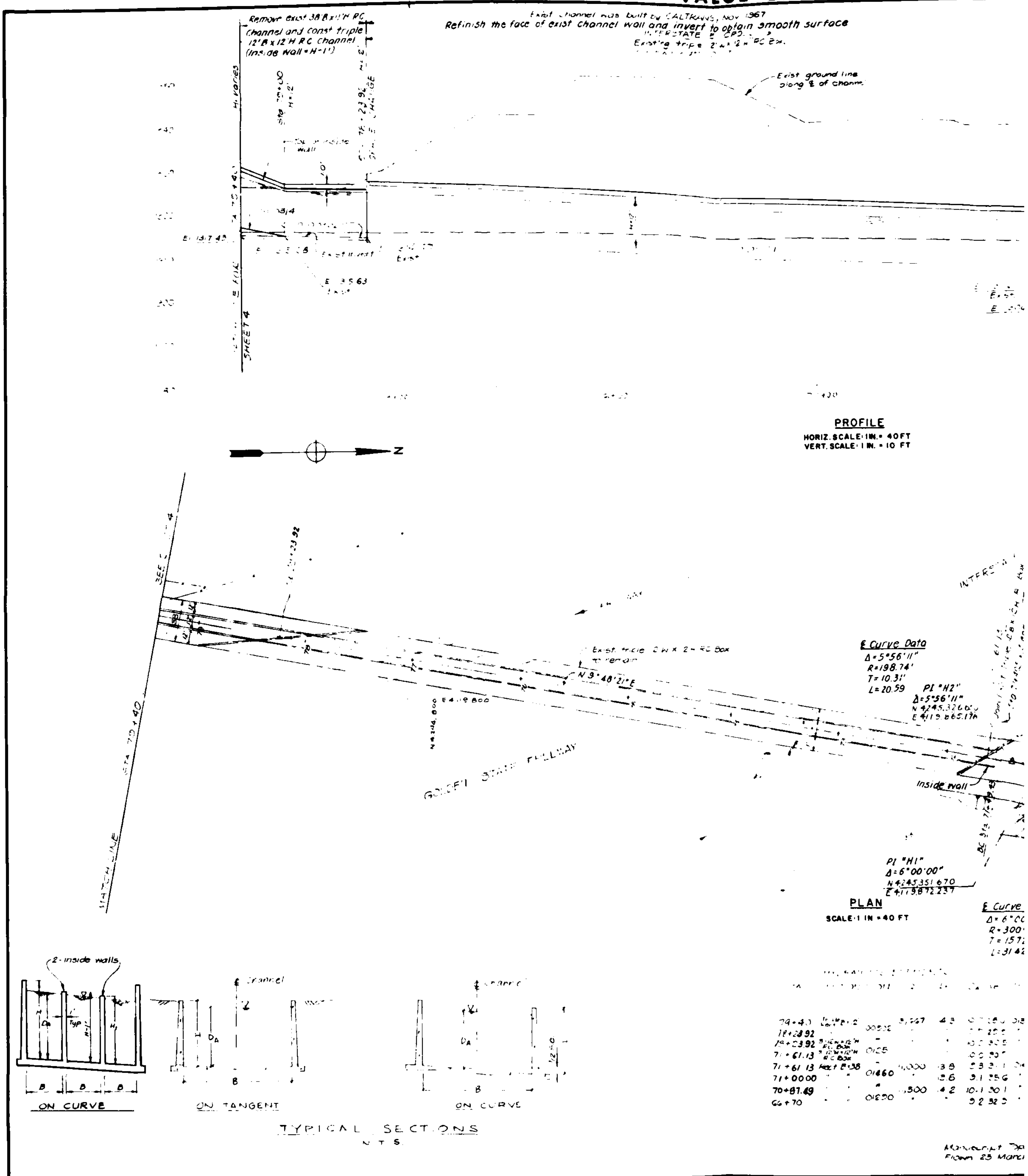
LOS ANGELES COUNTY, CALIFORNIA
SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT
CHANNEL IMPROVEMENT
PLAN AND PROFILE
STA. 79+40 TO STA. 90+79.29

SUBMITTED BY: | DATE APPROVED: | SPEC. NO. DACW09-___-B-___ | SHEET 4 OF 15
DISTRICT FILE NO.

PLATE D-4

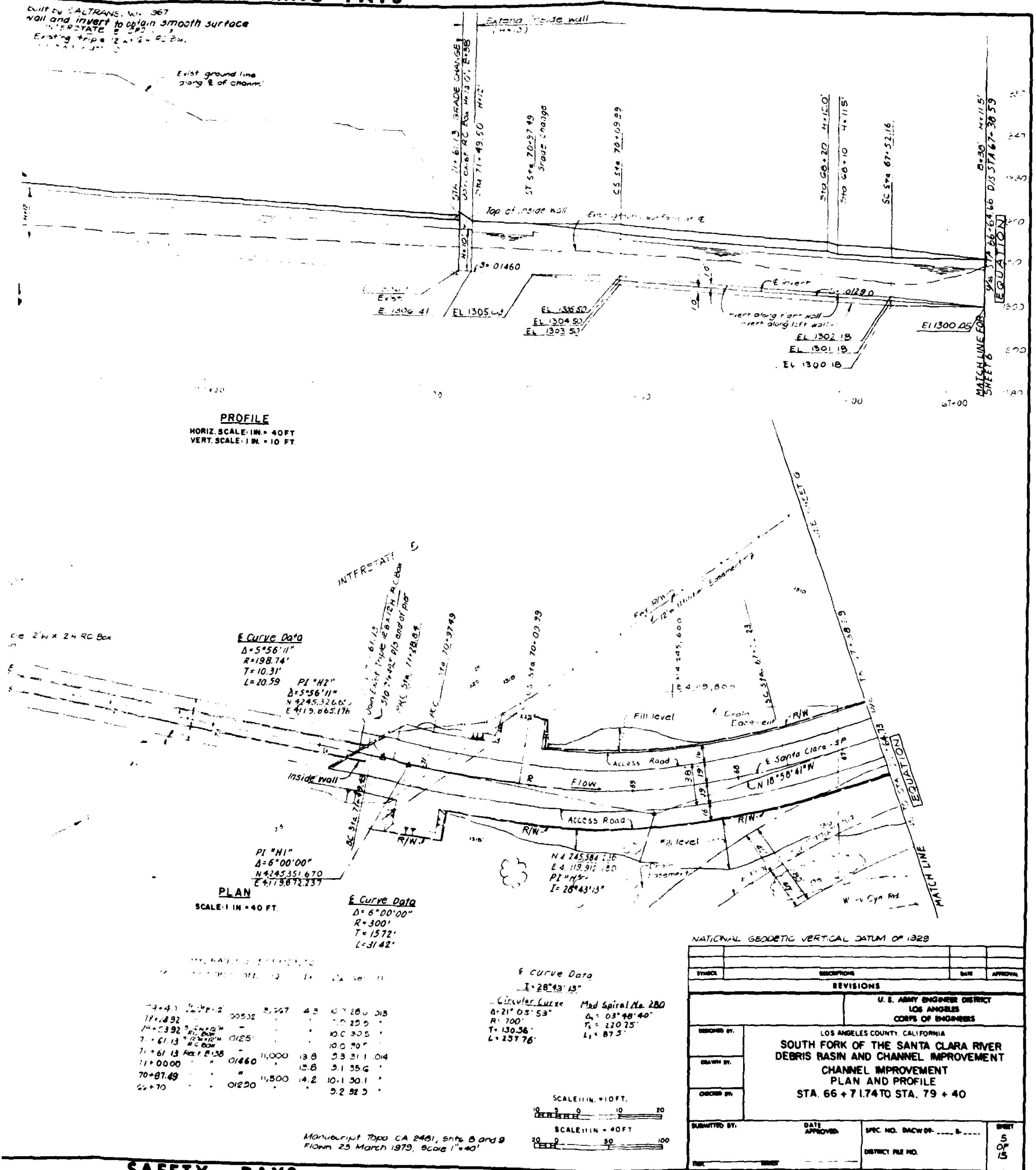
2

VALUE ENGINEERING PAYS



SAFETY PAYS

VALUE ENGINEERING PAYS



NATIONAL GEODETIC VERTICAL DATUM OF 1929

SYMBOL	DESCRIPTION	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

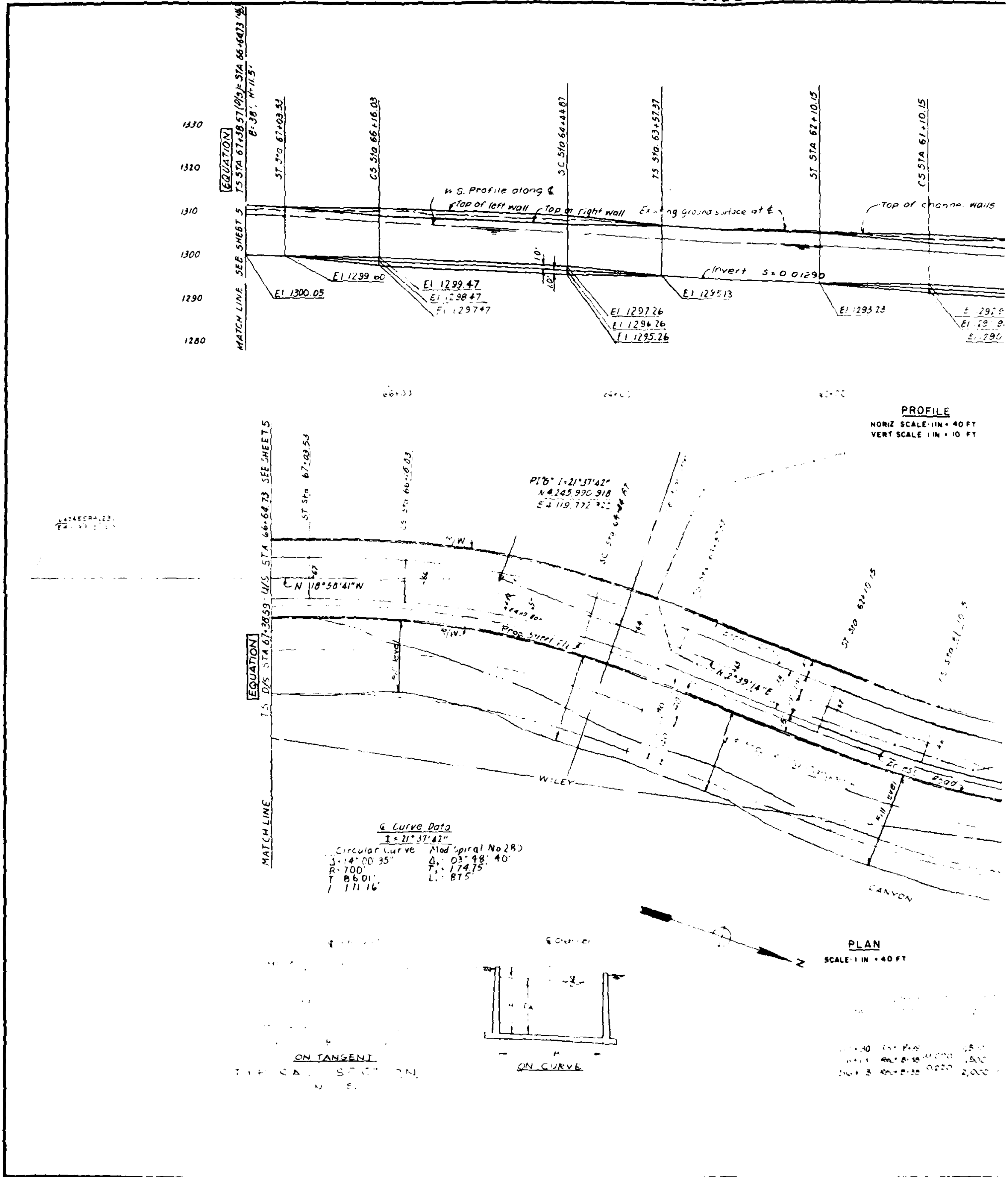
LOS ANGELES COUNTY, CALIFORNIA

SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT
CHANNEL IMPROVEMENT
PLAN AND PROFILE
STA. 66 + 71.74 TO STA. 79 + 40

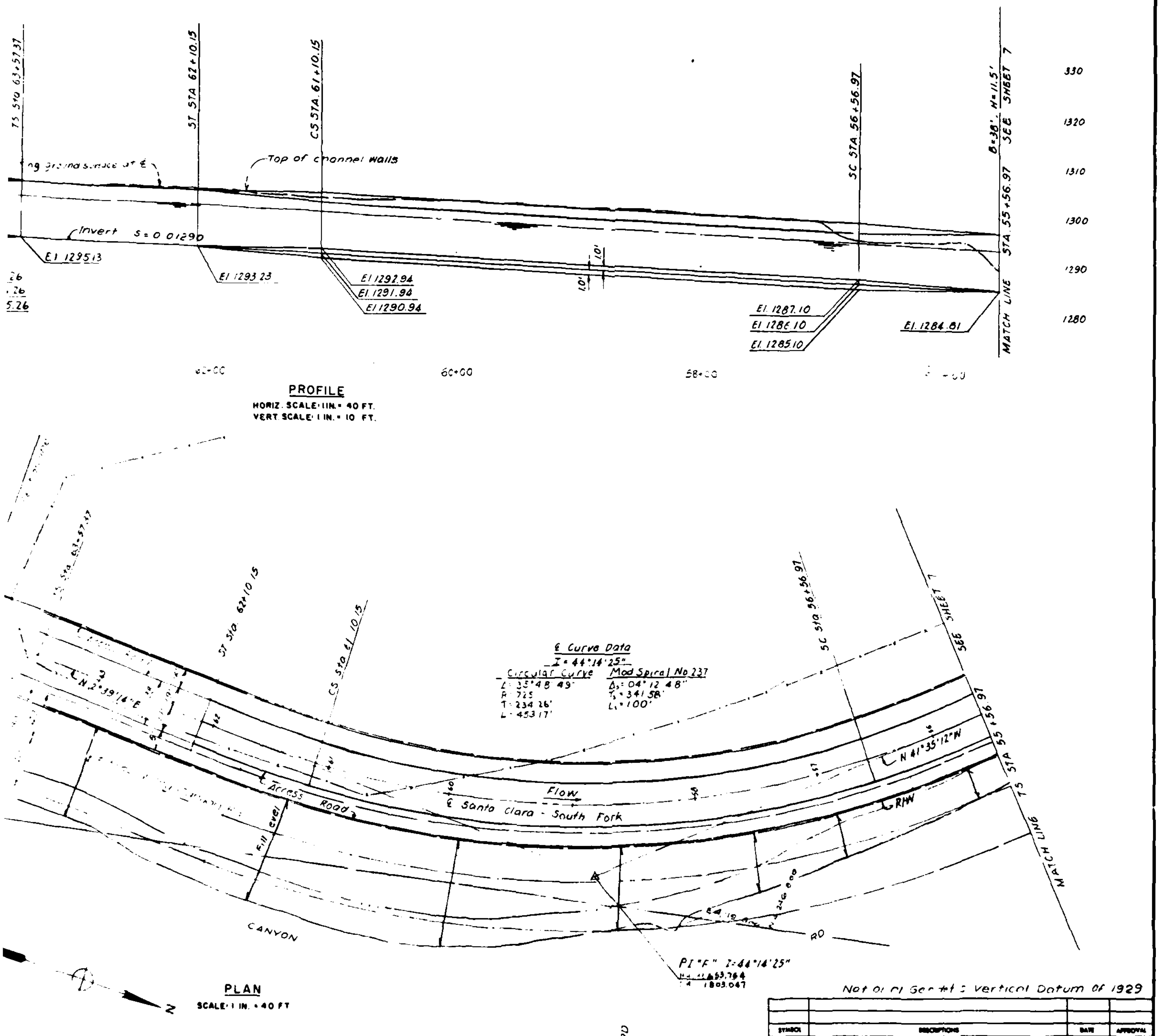
DESIGNED BY:
DRAWN BY:
CHECKED BY:
SUBMITTED BY:
DATE APPROVED:
SPEC. NO. DACW09-
DISTRICT FILE NO.
SHEET 5 OF 15

SAFETY PAYS

PLATE D-5


EQUATION
TS STA 67+38.57 (D/S) = STA 66+64.73 (U/S)
B=38', H=11.5'
MATCH LINE SEE SHEET 5
ST Sta 67+03.53
CS Sta 66+16.03
SC Sta 64+44.87
TS Sta 63+57.37
ST STA 62+10.15
CS STA 61+10.15
1330
1320
1310
1300
1290
1280
W.S. Profile along ℄
Top of left wall
Top of right wall
Existing ground surface at ℄
Top of channel walls
Invert S = 0.01290
El 1300.05
El 1299.60
El 1299.47
El 1298.47
El 1297.47
El 1297.26
El 1296.26
El 1295.26
El 1295.13
El 1293.23
PROFILE
HORIZ SCALE: 1 IN = 40 FT
VERT SCALE: 1 IN = 10 FT
EQUATION
T.S. D/S STA 67+38.57 = U/S STA 66+64.73 SEE SHEET 5
MATCH LINE
PI "B" I=21°37'42"
N 4,245,990.918
N 118°58'41"W
N 2°39'14"E
R/W
Prop Street
WILEY
CANYON
Access Road
℄ Curve Data
I = 21°37'42"
Circular Curve
R=700'
T=86.01'
Mod Spiral No 280
PLAN
SCALE: 1 IN = 40 FT
ON TANGENT
ON CURVE

VALUE ENGINEERING PAYS



Manuscript Topo CA 8691, Sh. 7 & 8
Flown 23 March 1973

National Geodetic Vertical Datum of 1929

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:
DRAWN BY:
CHECKED BY:

LOS ANGELES COUNTY, CALIFORNIA

SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

PLAN AND PROFILE
STA. 55+56.97 TO D/S STA.67+88.59-U/S STA.66+71.74

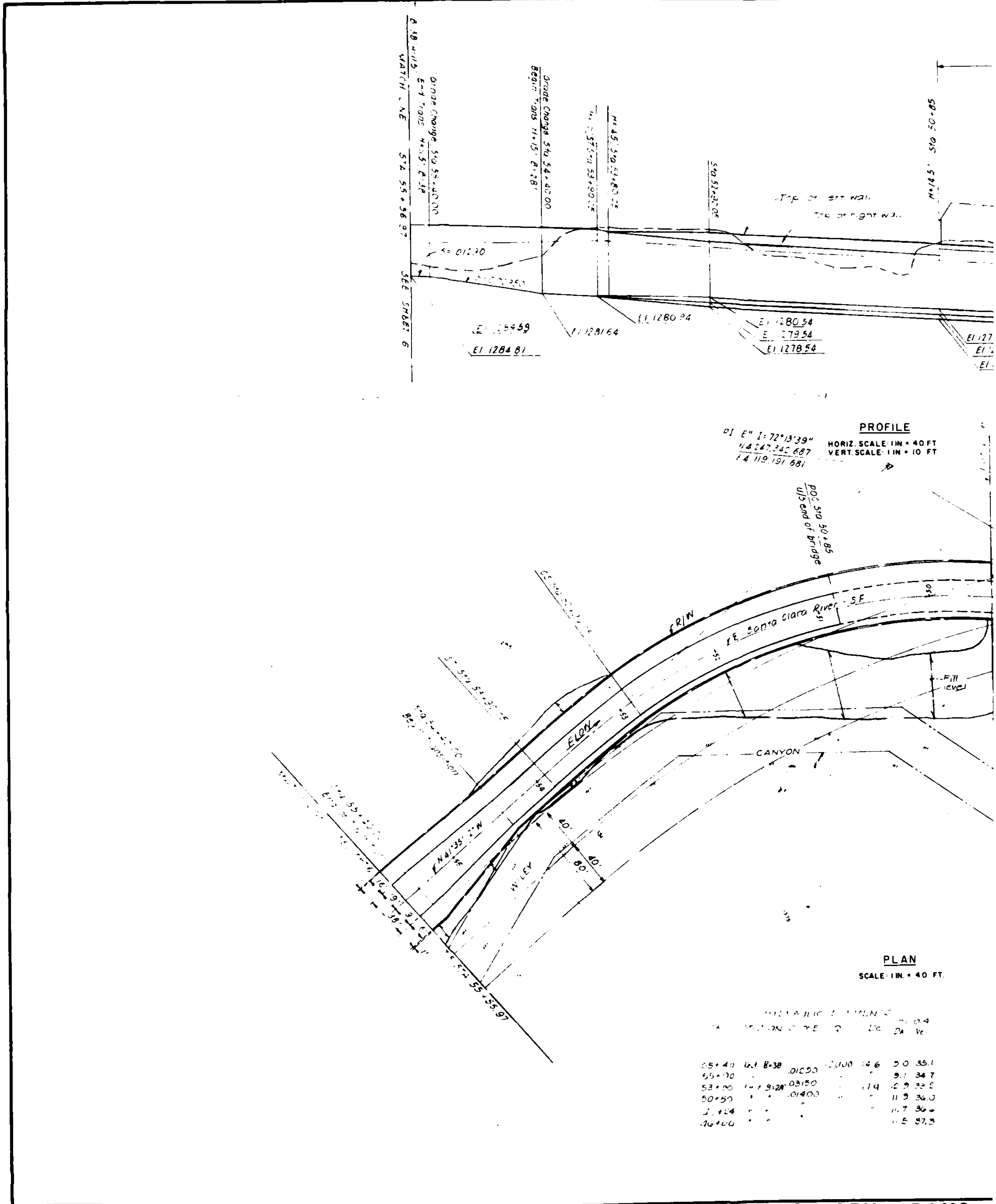
SCALE: 1 IN. = 10 FT.
SCALE: 1 IN. = 40 FT.

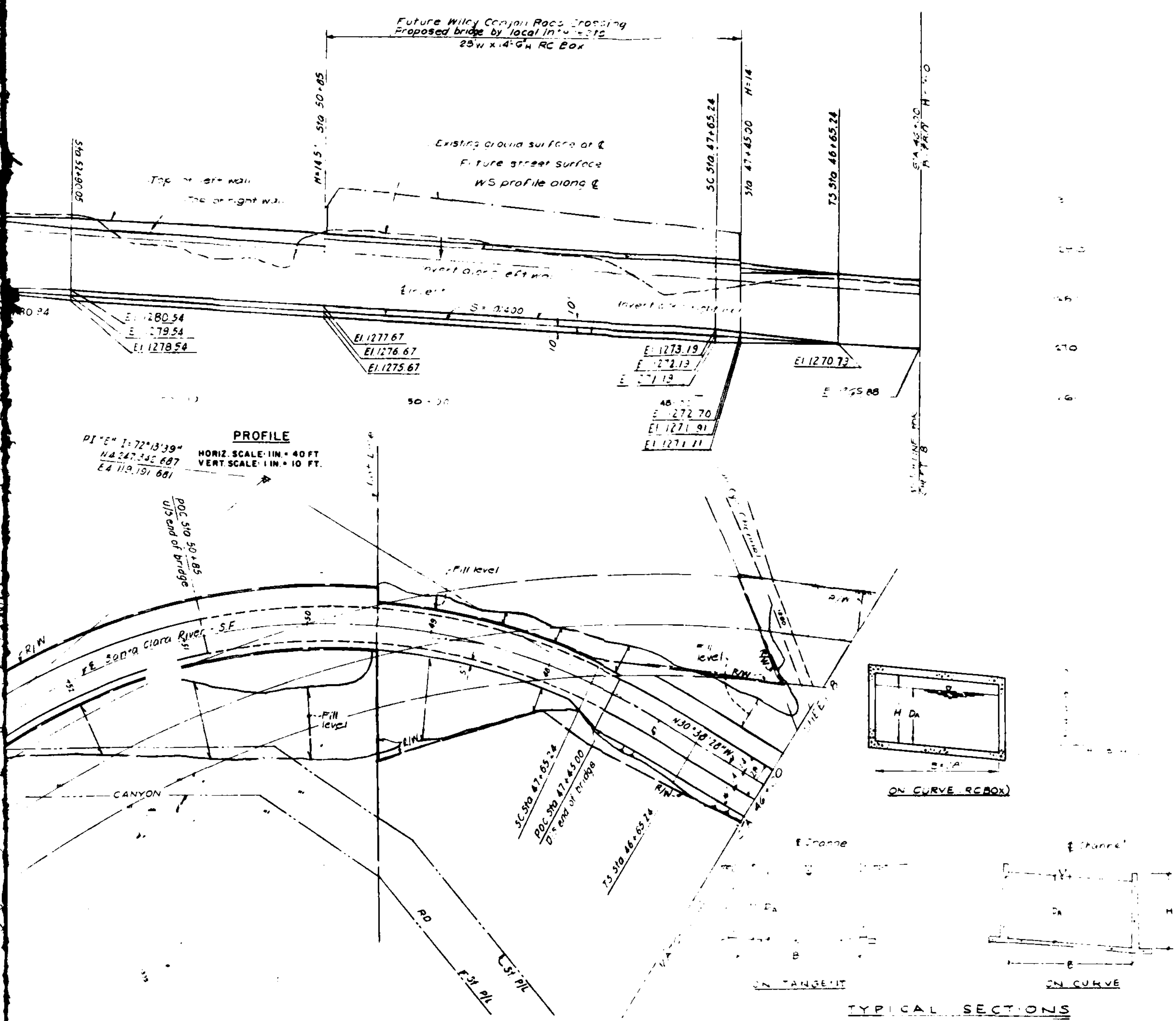
SUBMITTED BY:
DATE APPROVED:
SPEC. NO. DACW09-
DISTRICT FILE NO.
SHEET

SAFETY PAYS

PLATE D-6

VALUE ENGINEERING P





NATIONAL GEODETIC VERTICAL DATUM OF 1929

PLAN

SCALE: 1 IN. = 40 FT.

℄ Curve Data
I = 72°13'39"

Circular Curve
Δ = 60°08'19"
R = 500'
T = 289.48'
L = 524.81'

Mod Spiral No 340
Δ_1 = 06°02'40"
T_1 = 412.58'
L_1 = 100'

HYDRAULIC ELEMENTS

[illegible]	[illegible]	[illegible]	Q	Dc	n = .014 Dn	Vel
55+40	B-38	.01250	12,000	14.6	9.0	35.1
55+00					9.1	34.7
53+90	B-28	.03150		17.9	12.9	33.2
50+50		.01400			11.5	36.0
[illegible]					11.7	36.6
46+00					11.5	37.3

Manuscript Topo CA 2491 Sh 5
E 7 Flown 23 March

SCALE 1 IN. = 10 FT.

SCALE 1 IN. = 40 FT.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
REVISIONS			

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:
DRAWN BY:
CHECKED BY:

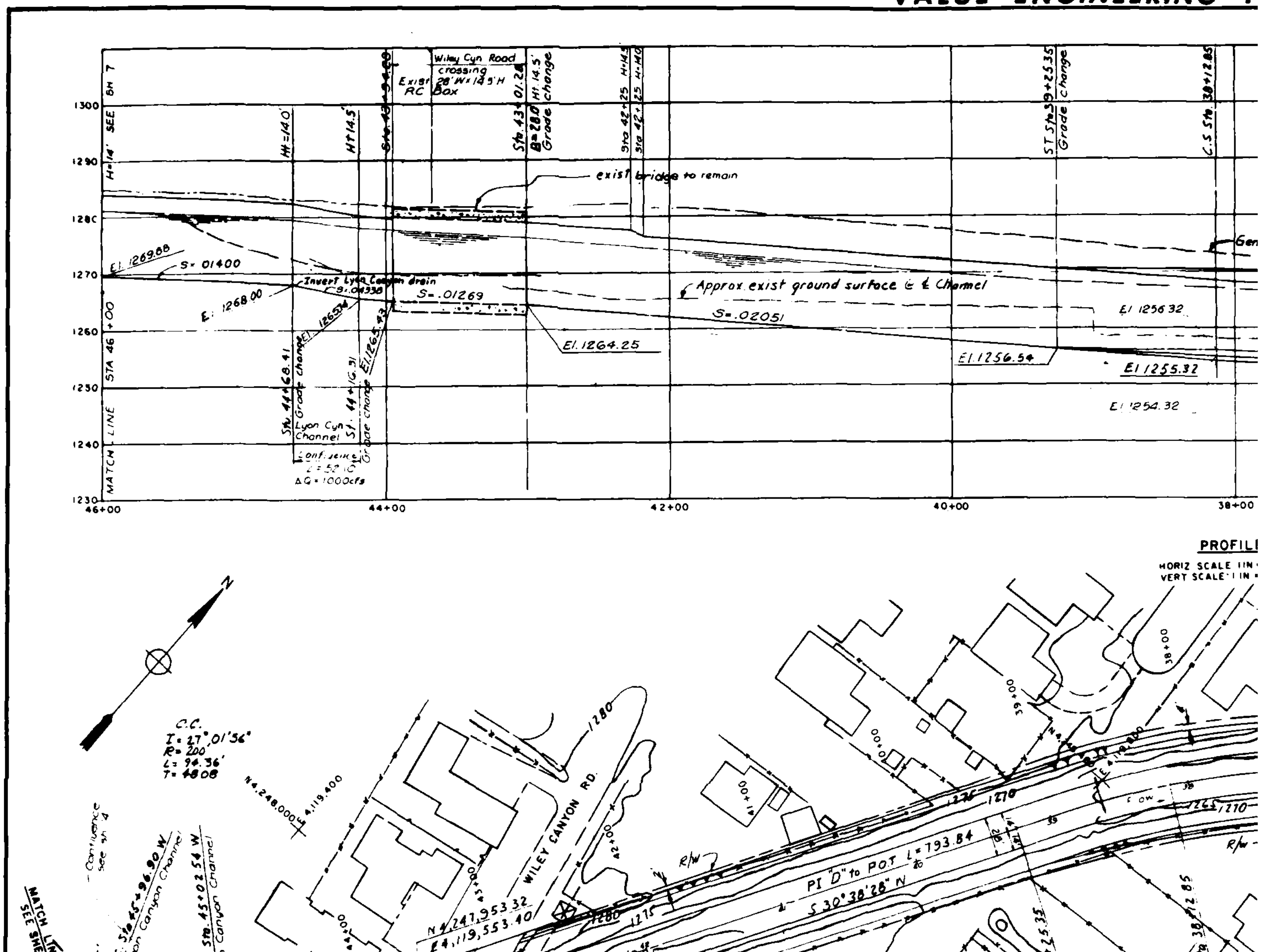
SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

PLAN AND PROFILE
STA. 46+00 TO STA. 55+56.97

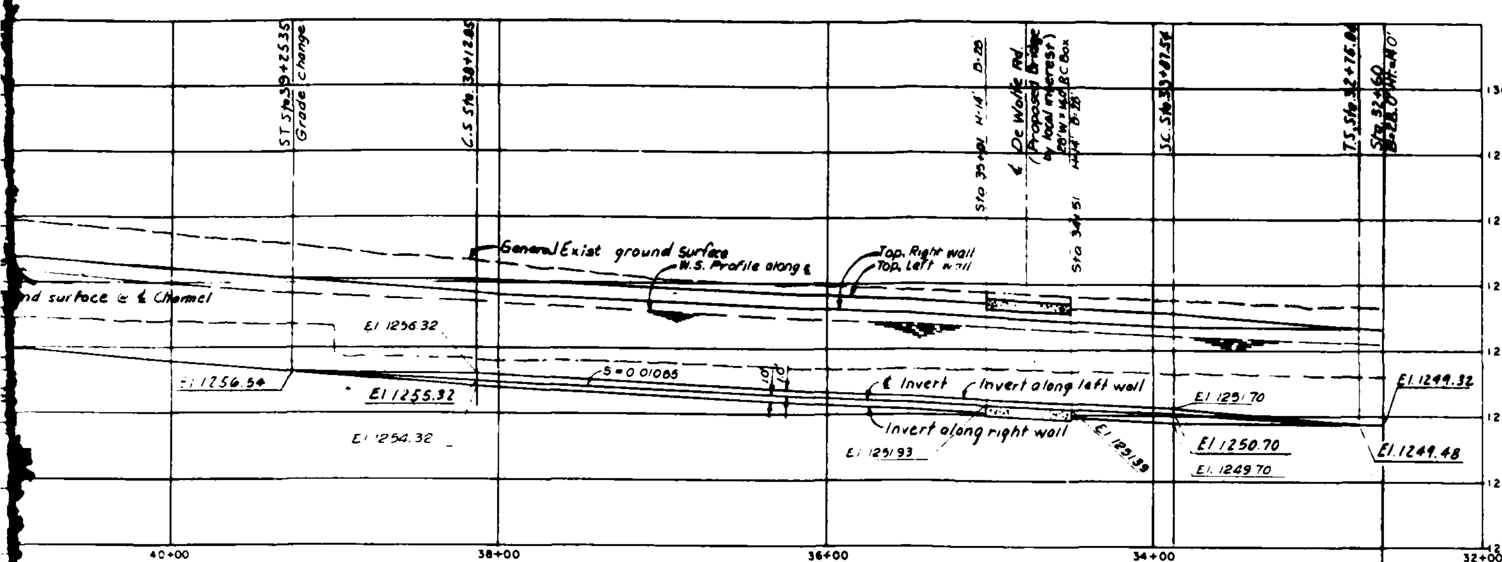
SUBMITTED BY: | DATE APPROVED: | SPEC. NO. DACW09-____-B-____ | SHEET 7 OF 15
DISTRICT FILE NO.

2

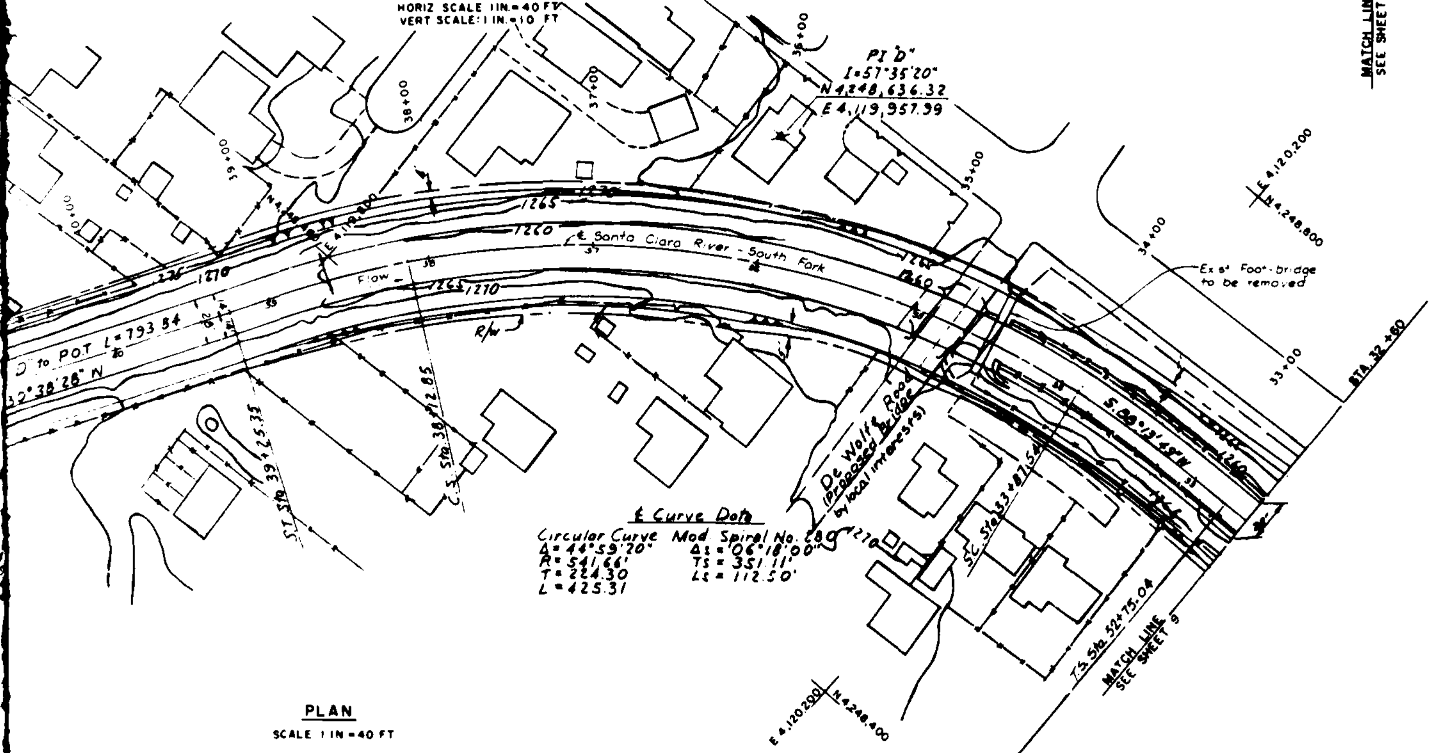
VALUE ENGINEERING P



SAFETY PAYS



PROFILE
HORIZ SCALE 1 IN = 40 FT
VERT SCALE 1 IN = 10 FT



PLAN
SCALE 1 IN = 40 FT

HYDRAULIC ELEMENTS						
STA	SECTION	SLOPE	Q	Dc	n = 0.014 Dn	Vel.
[illegible]	Rect 5:28	.01432	[illegible]	17.9	[illegible]	36.9
[illegible]	"	.01432	12,000	17.9	11.5	37.3
[illegible] 31	"		13,000	18.9	12.6	36.8
[illegible]	"		"		12.5	37.1
[illegible]	"	[illegible]	"		12.4	37.4
[illegible]	"	[illegible]	"		[illegible]	[illegible]
[illegible] 60	"	[illegible]			[illegible]	[illegible]

Confluence with Lyon Canyon ch
Q South Fork 12000 cfs
Q Lyon Canyon 1000 cfs

Manuscript Topo CA 2481 sht. 5
Flown 23 March 1979 scale 1"=40'

SCALE 1 IN = 10 FT
SCALE 1 IN = 40 FT

NATIONAL GEODETIC VERTICAL DATUM OF 1929

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
REVISIONS			

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:
DRAWN BY:
CHECKED BY:

LOS ANGELES COUNTY, CALIFORNIA

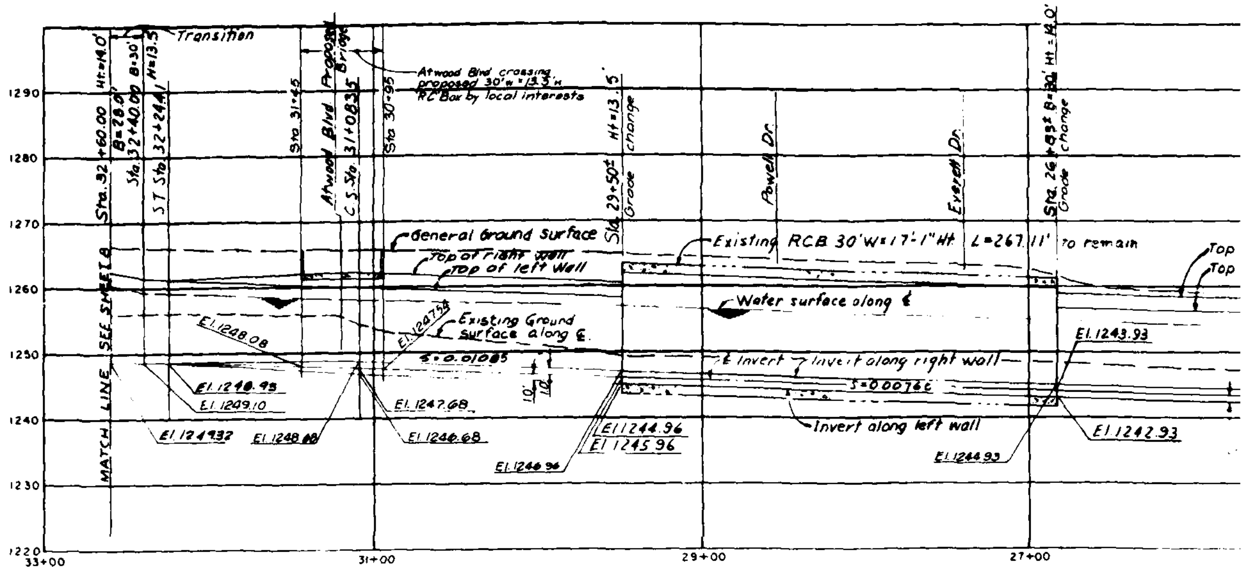
SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

PLAN AND PROFILE
STA. 32+60 TO STA 46+00

SUBMITTED BY: DATE APPROVED: SPEC. NO. DACW09-____-B-____ DISTRICT FILE NO. SHEET 8 OF 15

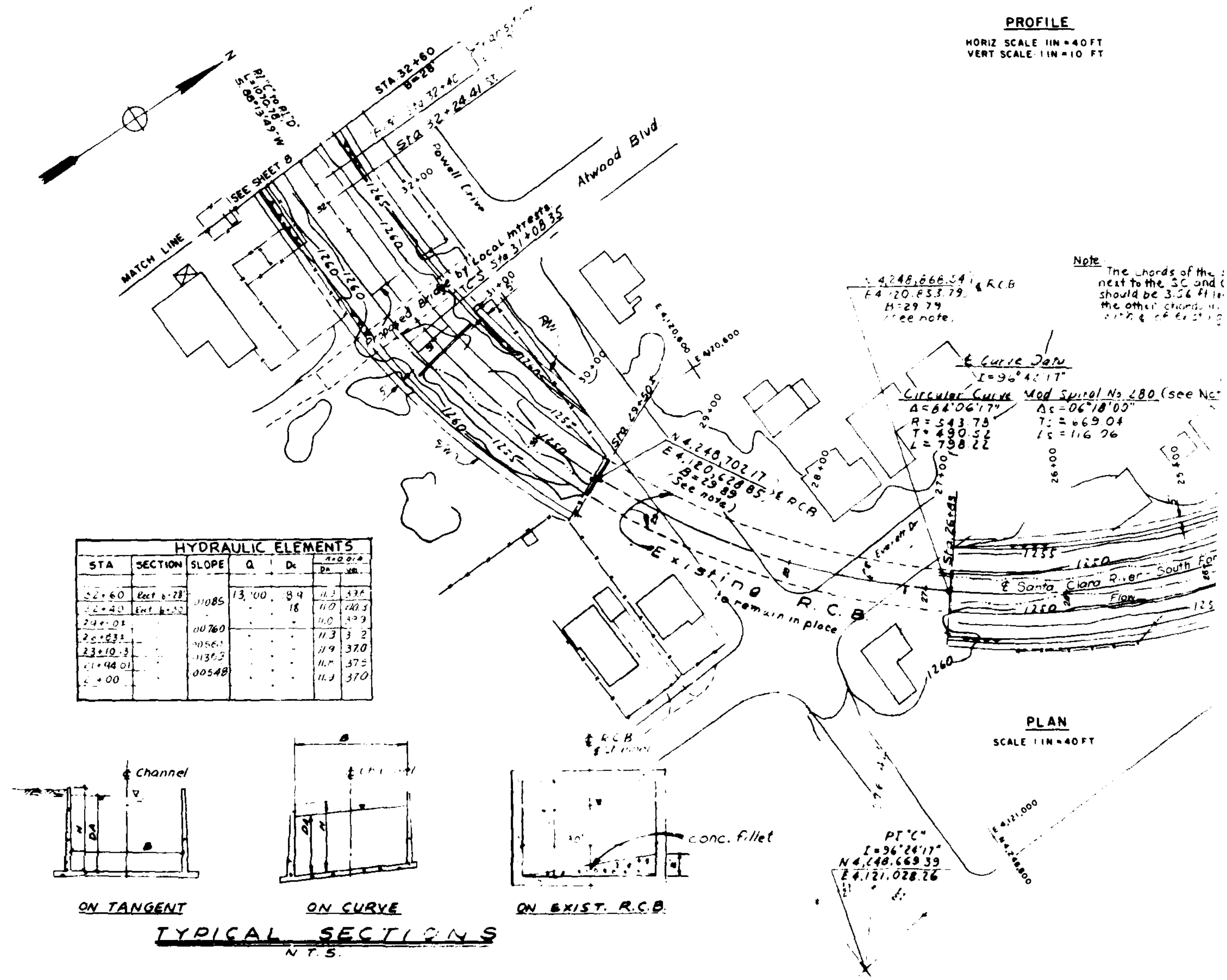
PLATE D-8

2

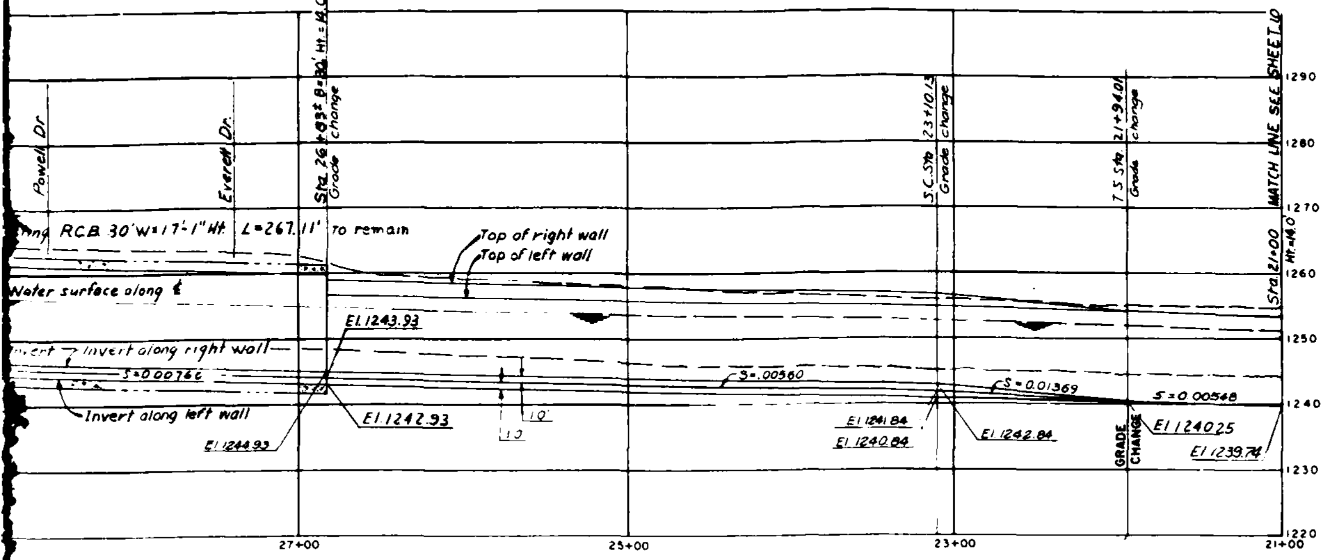


PROFILE

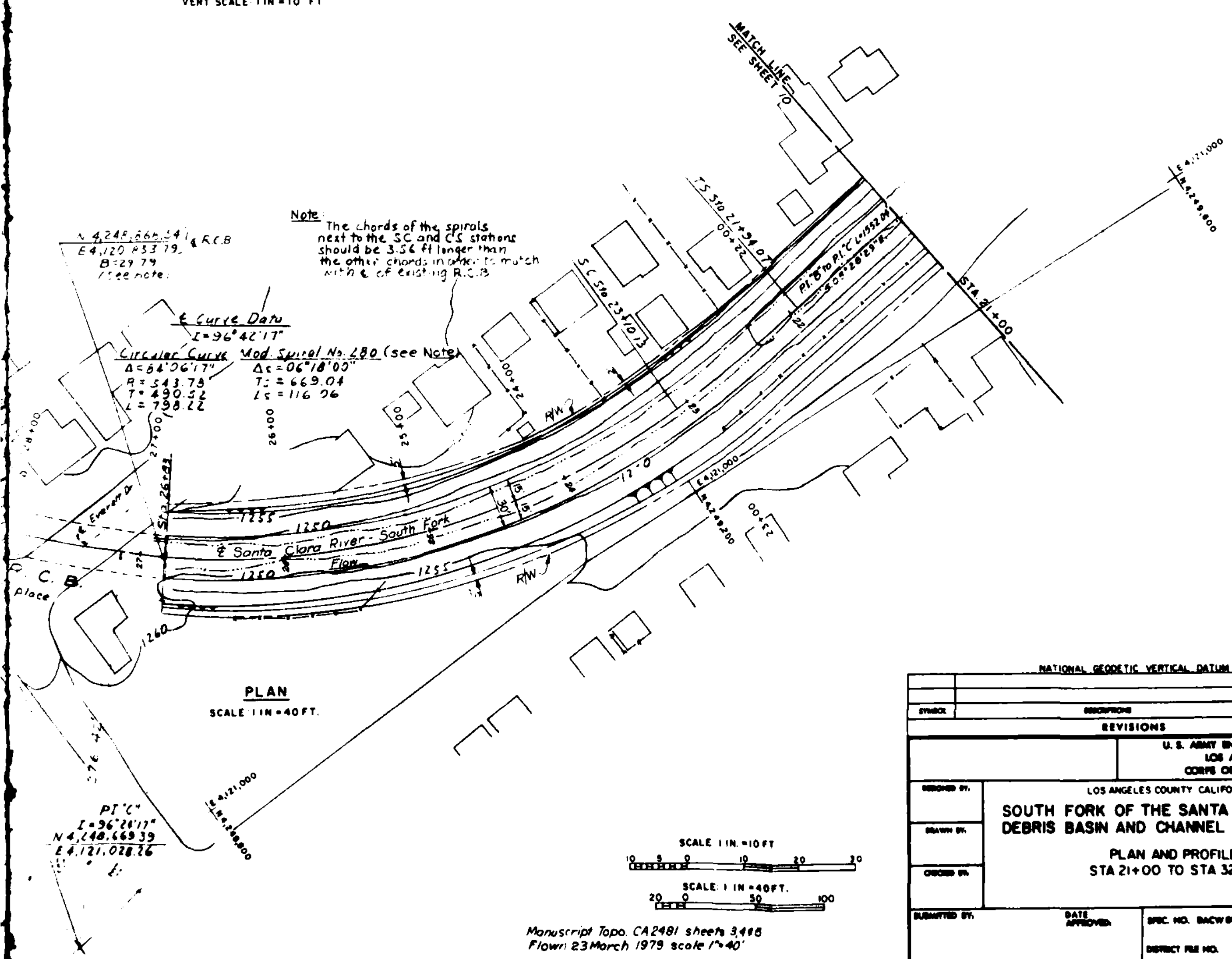
HORIZ SCALE 1IN = 40 FT
VERT SCALE 1IN = 10 FT



HYDRAULIC ELEMENTS						
STA	SECTION	SLOPE	Q	Dc	Dn	Vn
32+60	Rect b=28'	.01085	13,000	8.9	11.3	33.6
32+40	Rect b=30		.	18	11.0	40.3
29+50±	.	.	.	.	11.0	39.9
26+93±		.00760	.	.	11.3	3 2
23+10.3	.	.00560	.	.	11.9	37.0
21+94.01	.	.01303	.	.	11.8	37.5
2 +00	.	.00548	.	.	11.3	37.0



PROFILE
HORIZ SCALE 1IN = 40 FT
VERT SCALE 1 IN = 10 FT



PLAN
SCALE 1 IN = 40 FT.

SCALE 1 IN. = 10 FT
SCALE 1 IN = 40 FT.

Manuscript Topo. CA 2481 sheets 3,4&8
Flown 23 March 1979 scale 1"=40'

NATIONAL GEODETIC VERTICAL DATUM OF 1929

SYMBOL	DESCRIPTION	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

LOS ANGELES COUNTY CALIFORNIA

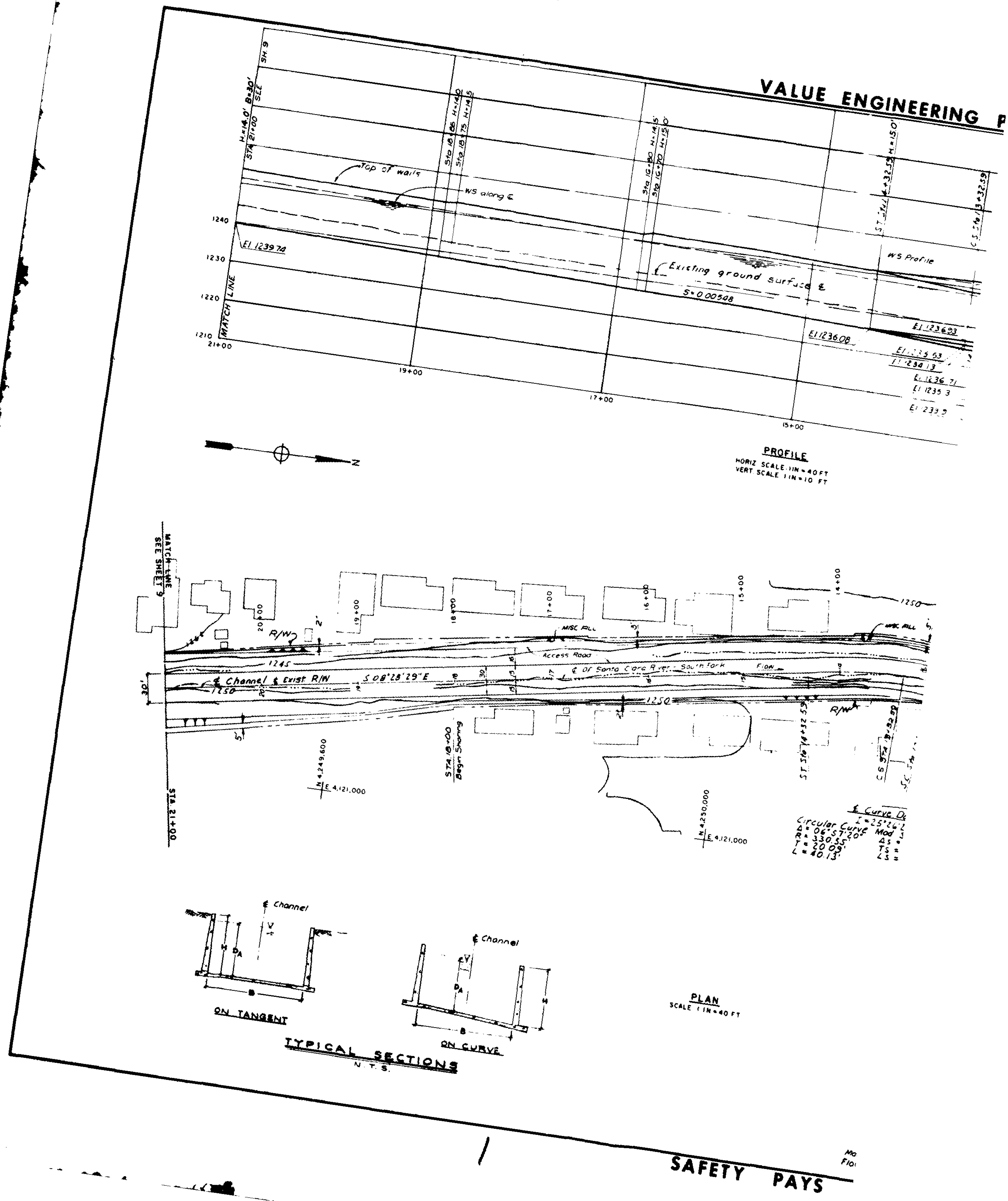
SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

PLAN AND PROFILE
STA 21+00 TO STA 32+60

DESIGNED BY:
DRAWN BY:
CHECKED BY:
SUBMITTED BY:
DATE APPROVED:
SPEC. NO. DACW09-
DISTRICT FILE NO.
SHEET 9 OF 18

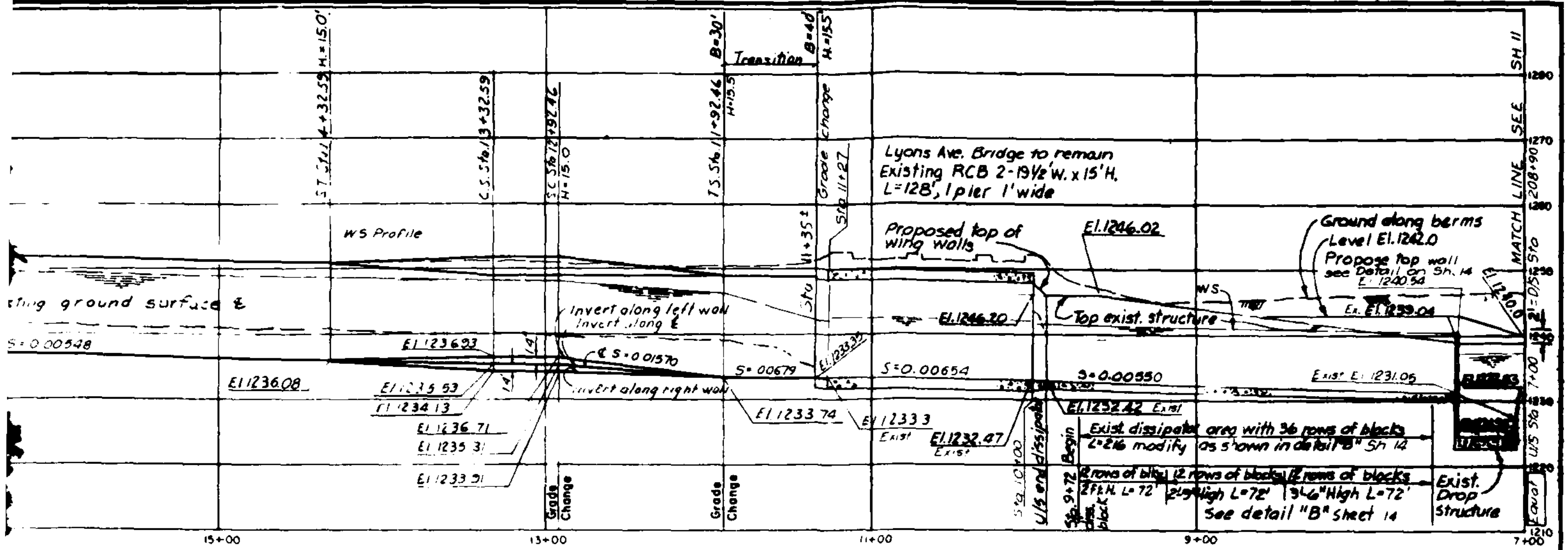
PLATE D-9

2



VALUE ENGINEERING P
PROFILE
HORIZ SCALE 1 IN = 40 FT
VERT SCALE 1 IN = 10 FT
Top of walls
WS along ℄
WS Profile
Existing ground surface ℄
S = 0.00548
MATCH LINE
SEE SH. 9
STA 21+00
PLAN
SCALE 1 IN = 40 FT
MATCH LINE SEE SHEET 9
STA 21+00
℄ Channel ℄ Exist R/W S 08°28'29" E
℄ Of Santa Clara River - South Fork
Access Road
STA 18+00 Begin Shoring
℄ Curve Data
Circular Curve
TYPICAL SECTIONS
N.T.S.
ON TANGENT
ON CURVE
℄ Channel
SAFETY PAYS

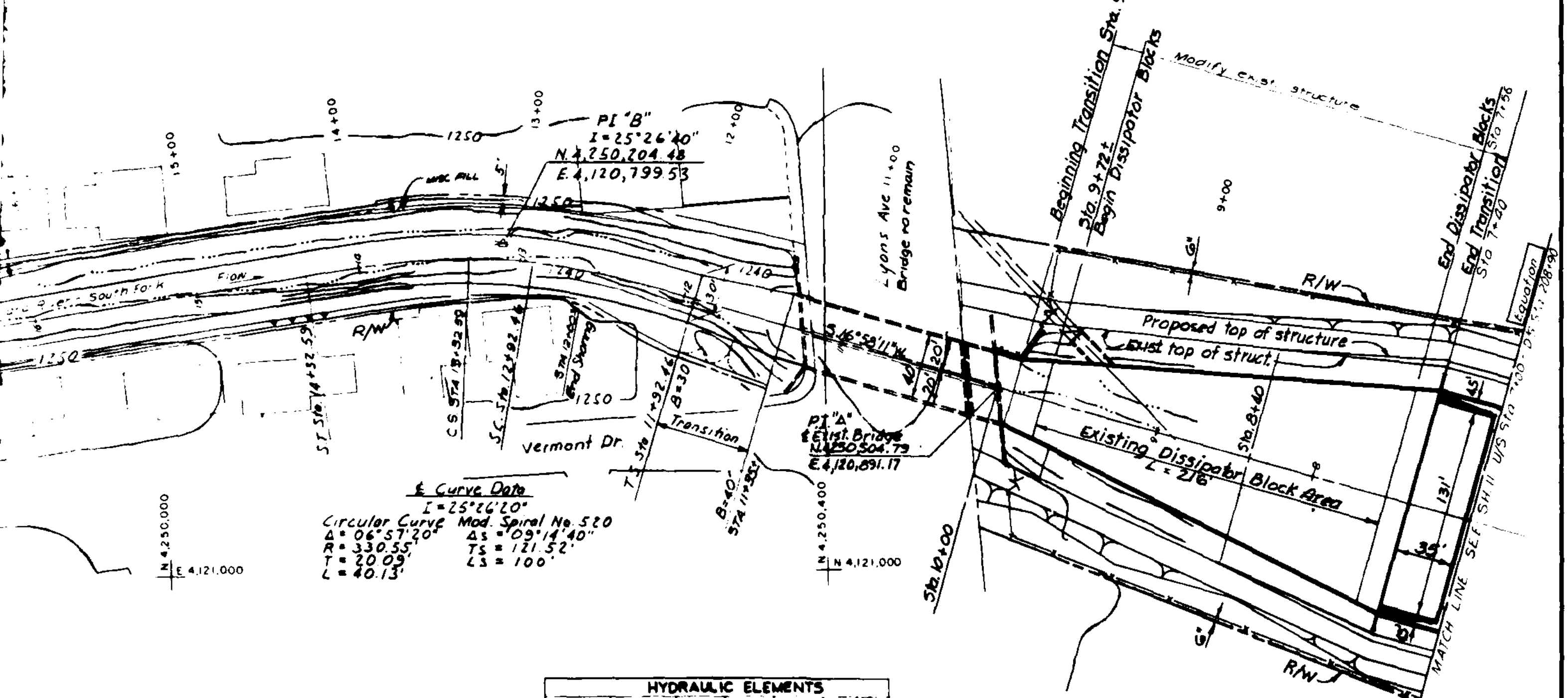
VALUE ENGINEERING PAYS



PROFILE

HORIZ SCALE 1 IN = 40 FT
VERT SCALE 1 IN = 10 FT

Note:
Existing dissipator was designed for a discharge of 10450 cfs.



℄ Curve Data
I = 25°26'20"
Circular Curve: Δ = 06°57'20", R = 330.55', T = 20.09', L = 40.13'
Mod. Spiral No. 520: Δs = 09°14'40", Ts = 121.52', Ls = 100'

PLAN

SCALE 1 IN = 40 FT

HYDRAULIC ELEMENTS

STA	SECTION	SLOPE	Q	Dc	n=.018 Dn	n=.018 Vel
[illegible]+00	[illegible] B=30		[illegible]	[illegible]	[illegible]	[illegible]
12+92.46		.00548			[illegible]	[illegible]
[illegible]		.01570			[illegible]	[illegible]
[illegible]	Rect B=40	.00[illegible]		[illegible]	[illegible]	[illegible]
9+00	[illegible] B=40			15	[illegible]	[illegible]
[illegible]+90	Rect B=40	.00[illegible]		[illegible]	[illegible]	[illegible]
7+41	Tran. Trap. B=40			[illegible]	[illegible]	[illegible]
7+[illegible]	[illegible] Wall [illegible]			[illegible]	[illegible]	14.7

SCALE 1 IN = 10 FT

SCALE 1 IN = 40 FT

Manuscript Topo. CA 2481 sht. 3
Flown 23 March 1979 scale 1"=40'

NATIONAL GEODETIC VERTICAL DATUM OF 1929

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

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DRAWN BY:
CHECKED BY:

LOS ANGELES COUNTY, CALIFORNIA

SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

PLAN AND PROFILE
U/S STA. 7+00 = D/S STA. 208+90 TO STA. 21+00

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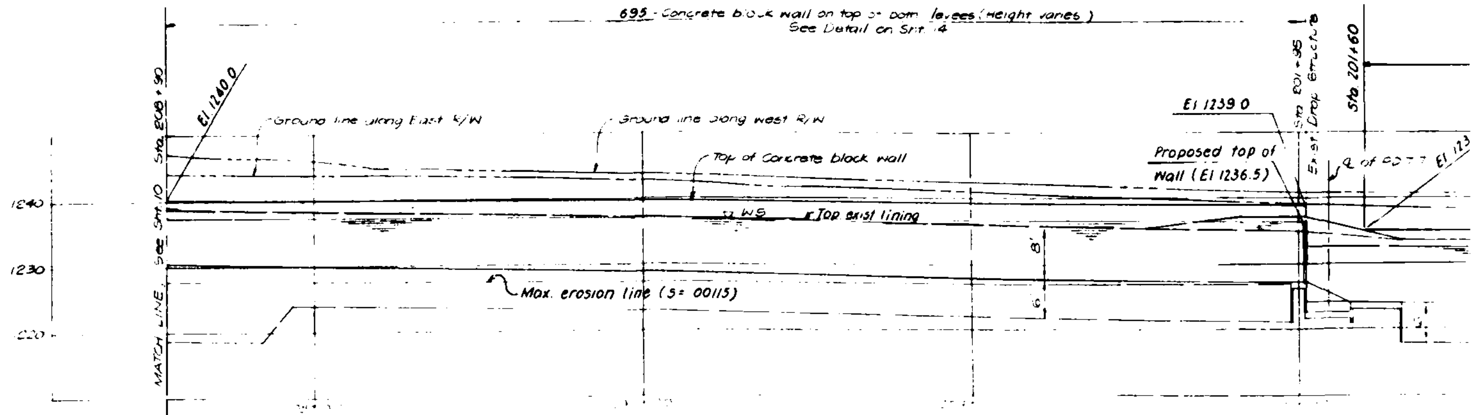
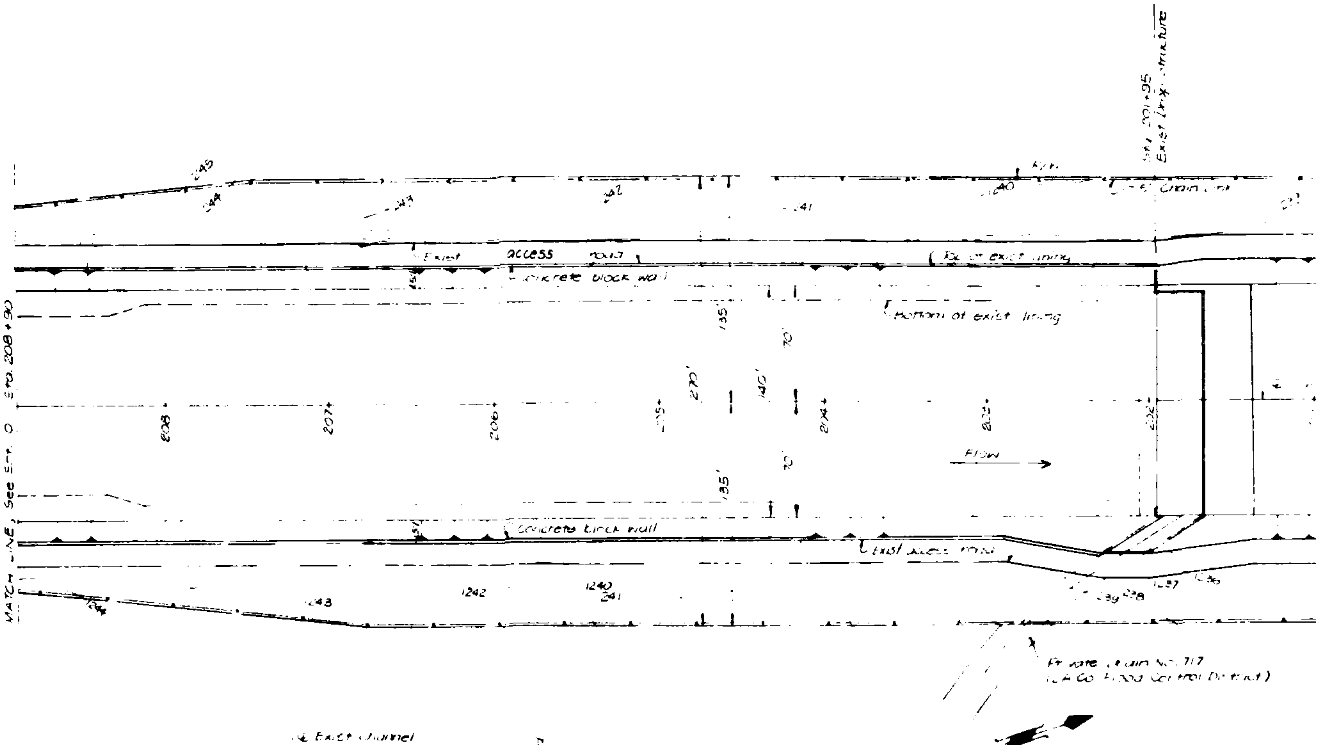
DISTRICT FILE NO.

SAFETY PAYS



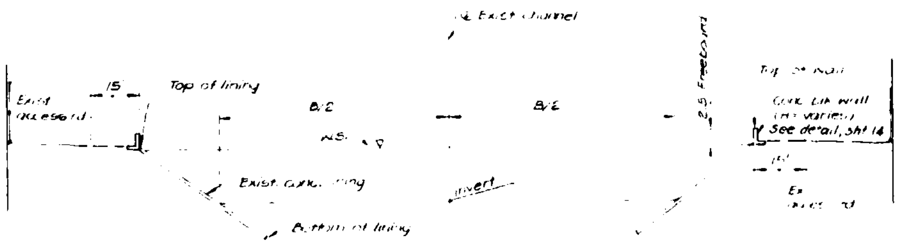
PROFILE
HORIZ SCALE 1 IN = 40 FT
VERT SCALE 1 IN = 10 FT



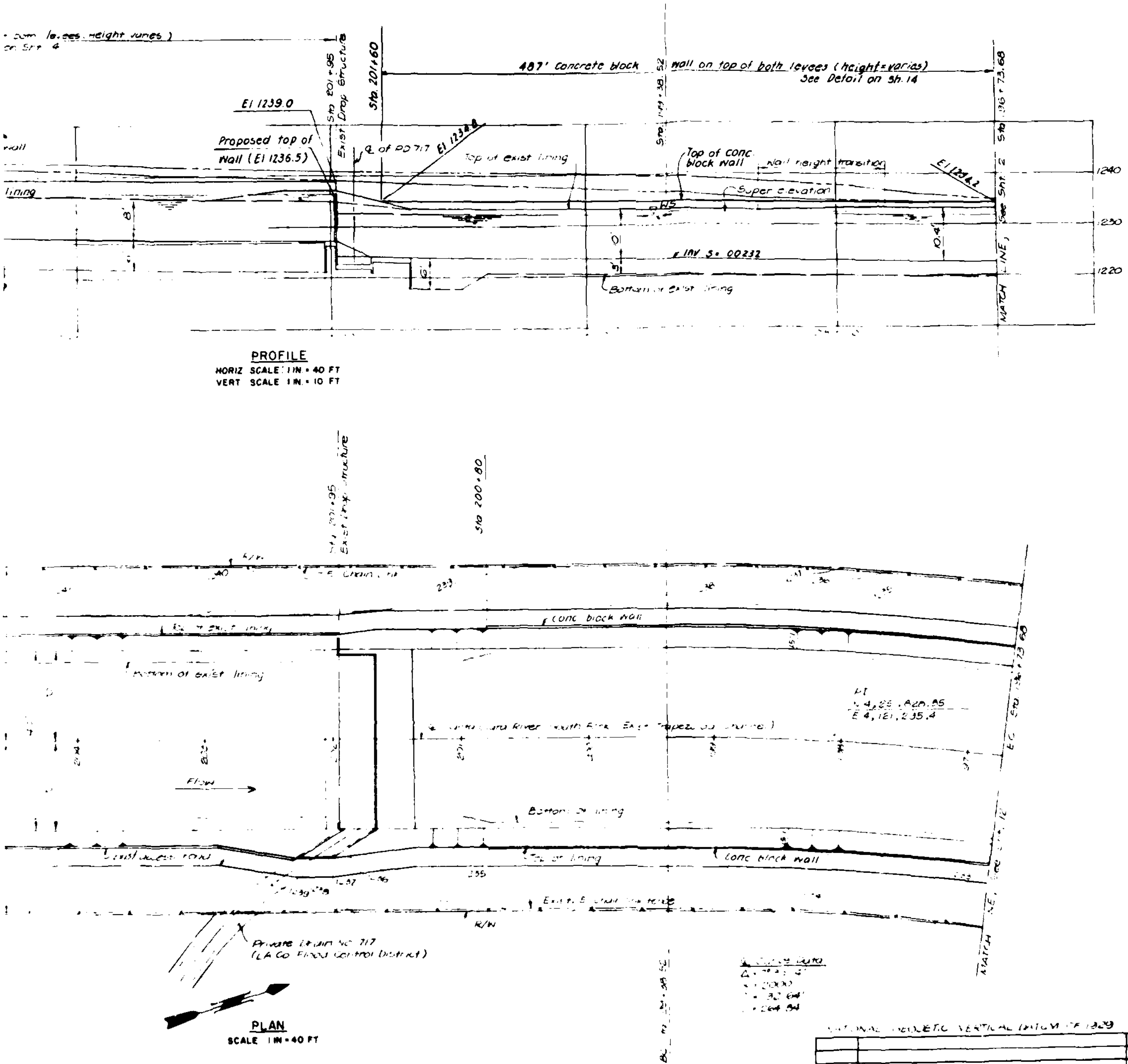
PLAN
SCALE 1 IN = 40 FT

HYDRAULIC ELEMENTS

[illegible]



TYPICAL CROSS SECTION
NOT TO SCALE



HYDRAULIC ELEMENTS n = .025

STATION	SECTION	SLOPE	Q	℄	Dn	Vel
[illegible]+22.99	Trap, B=40, 2:1 S	.00115	13,000	6.30	9.5	6.9
20[illegible]+95.50	"	"	"	"	9.5	8
2[illegible]+55.40	"	"	.00232	13,000	6.30	8.7	9.8
20[illegible]+05.40	"	"	"	"	"	8.7	9.8

Manuscript Topo Co 2481 ... 2 ... March 1973 ... 1"=40'
As Built Plans, Los Angeles County Flood Control District, Dwg No ...

SCALE 1 IN = 10 FT

SCALE 1 IN = 40 FT

NATIONAL GEODETIC VERTICAL DATUM OF 1929

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

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CORPS OF ENGINEERS

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LOS ANGELES COUNTY CALIFORNIA

SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

CHANNEL IMPROVEMENT
PLAN AND PROFILE
STA 196+73.68 TO STA 208+90

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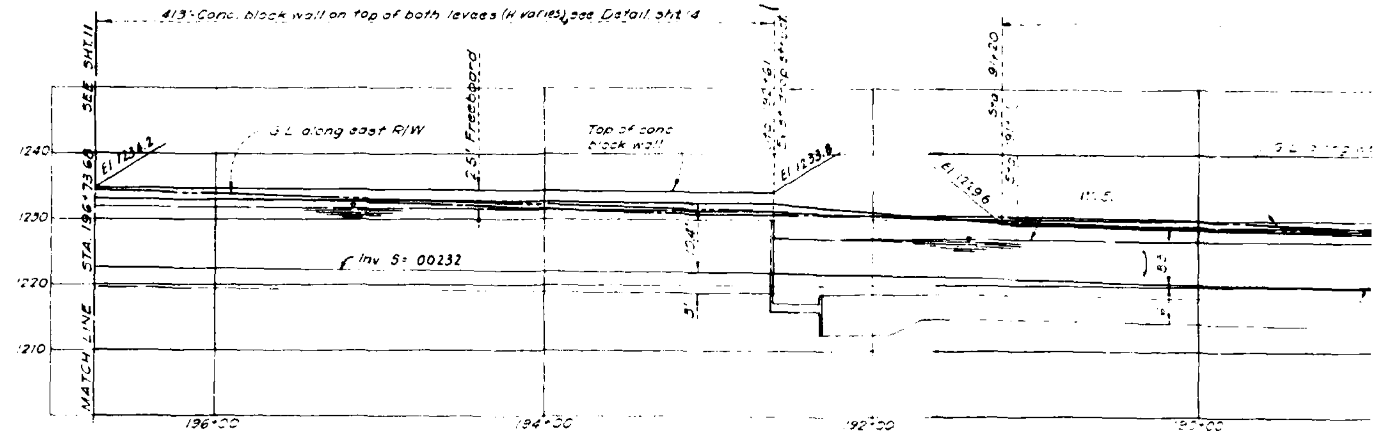
DISTRICT FILE NO

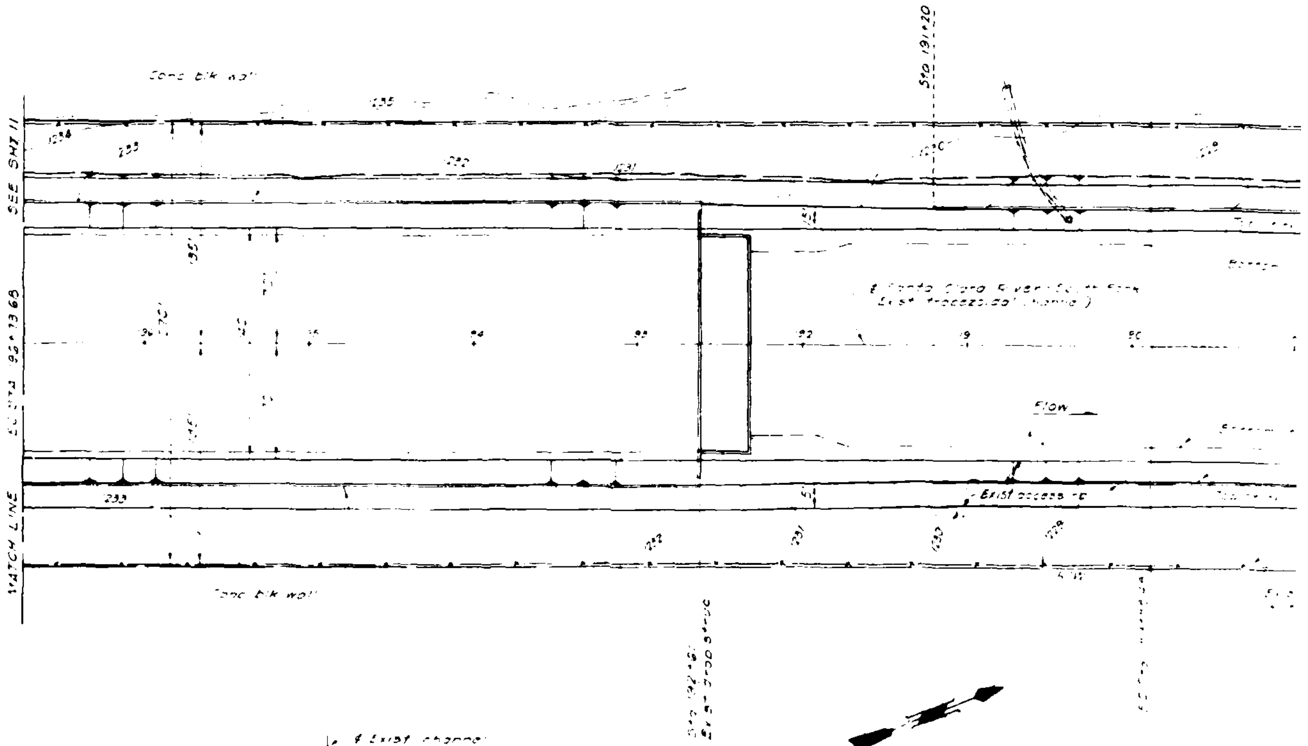
PLATE D-1

2



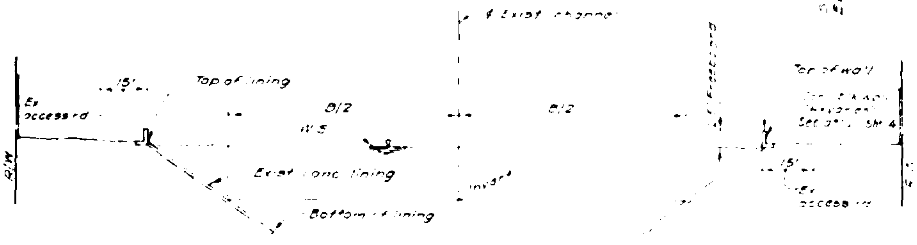
PROFILE

HORIZ. SCALE: 1 IN = 40 FT
VERT. SCALE: 1 IN = 10 FT



PLAN

SCALE: 1 IN = 40 FT



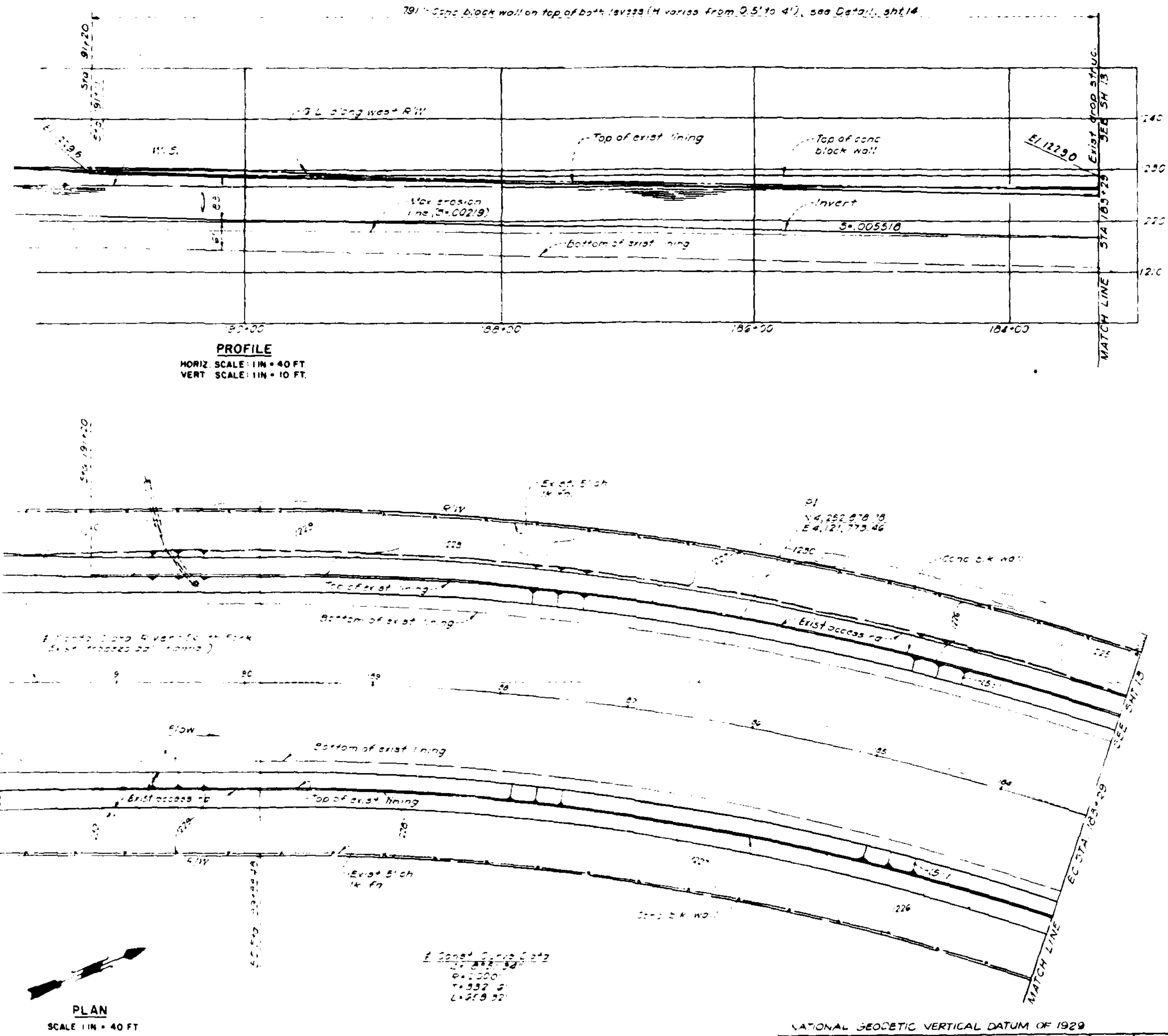
TYPICAL CROSS SECTION

NOT TO SCALE

Station	Section	Slope			
192+6 50	Imp B 140,215	00230	3,000	6 80	[illegible]
188+23 78	Imp B 140,215	00552	3,000	6 30	[illegible]
93+50	Imp B 140,215	00552	13,000	6 30	[illegible]
83+25	Imp B 140,215	00550	3,000	6 30	[illegible]

SAFETY PAYS

VALUE ENGINEERING PAYS



HYDRAULIC ELEMENTS n = .025						
STATION	SECTION	SLOPE	Q	Cc	Dn Eo	Dn Vel.
192+61.50	Trap 8' 140' 2:1.5	.00230	13,000	6.80	3.5	8.9
188+23.78	Trap 8' 140' 2:1.5	.00552	13,000	6.30	9.0	9.4
183+90	Trap 8' 140' 2:1.5	.00552	13,000	6.30	5.5	8.9
185+25	Trap 8' 140' 2:1.5	.00550	13,000	6.30	8.1	10.5

Manuscript Topo Fd 2481, sht 42 Flown 29 March 1979 Scale 1"=40'
As-Built Plan Los Angeles County Flood Control District Dwg. No. 337-F16 3 & 16 4

SCALE 1 IN = 10 FT

SCALE 1 IN = 40 FT

NATIONAL GEODETIC VERTICAL DATUM OF 1929

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

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CORPS OF ENGINEERS

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LOS ANGELES COUNTY, CALIFORNIA
SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

CHANNEL IMPROVEMENT
PLAN AND PROFILE
STA 183+29 TO STA 196+73.68

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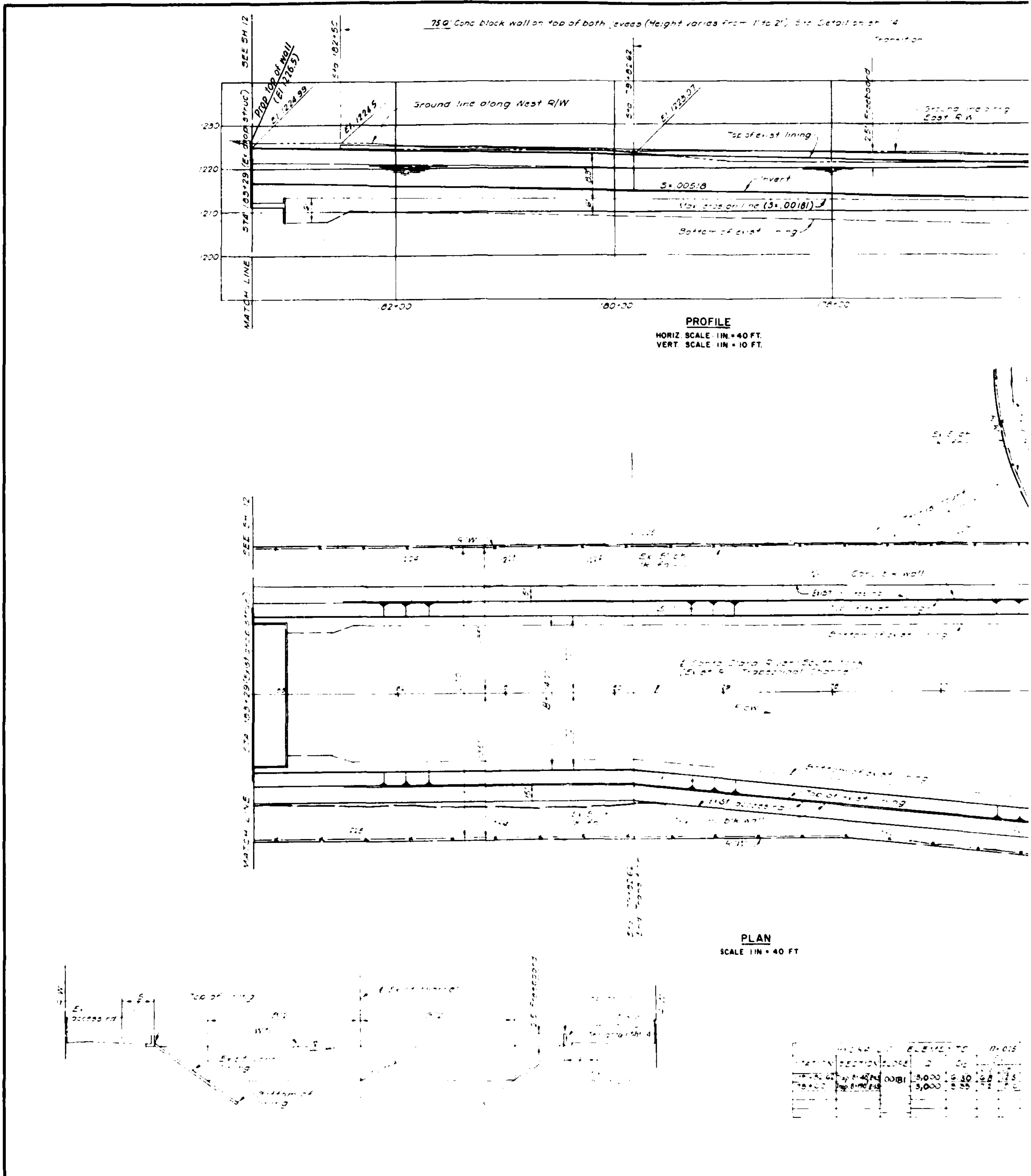
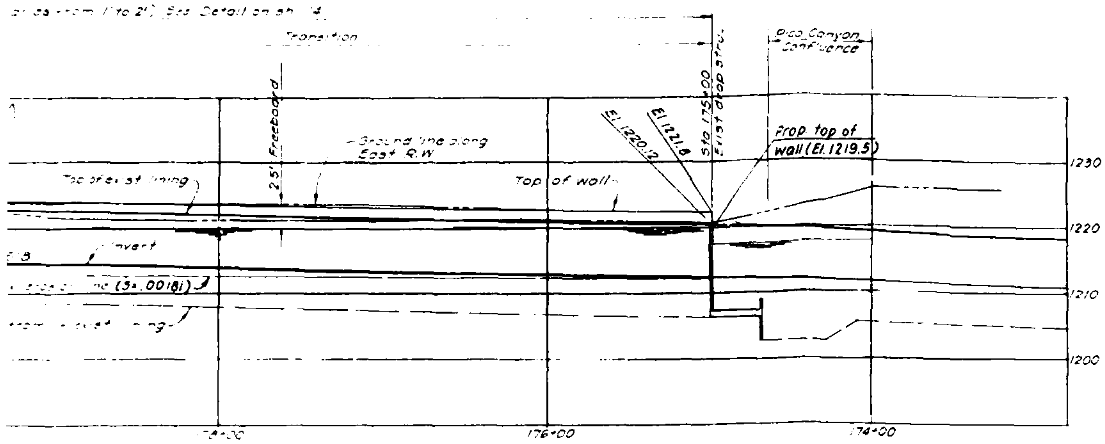
DISTRICT FILE NO.

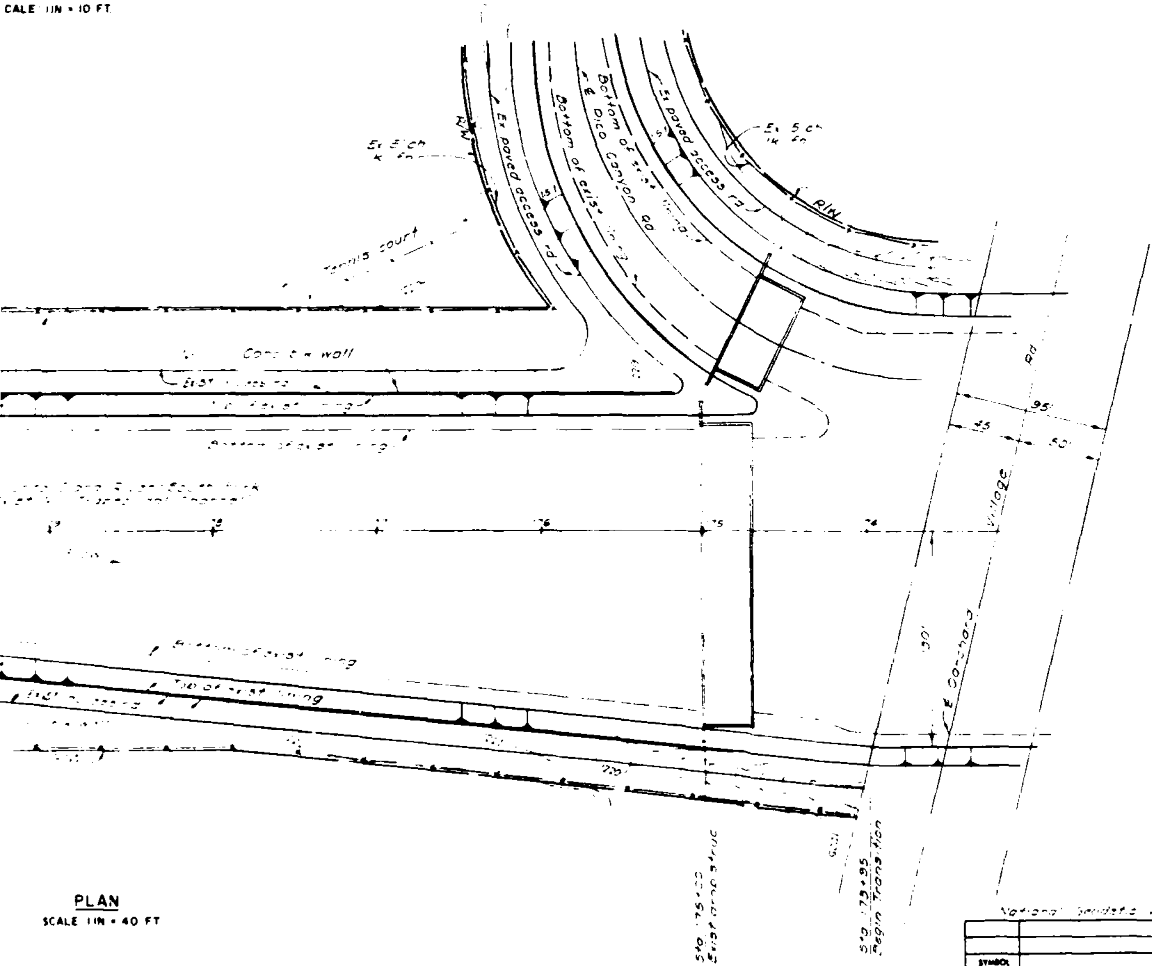
SAFETY PAYS

PLATE


SEE SH 12
MATCH LINE
Prop top of wall (El 1226.5)
El 1224.99
El 1226.5
Ground line along West R/W
El 1225.07
Top of exist lining
S = .00518
Invert
Bottom of exist lining
1230
1220
1210
1200
182+00
180+00
PROFILE
HORIZ. SCALE 1 IN. = 40 FT.
VERT. SCALE 1 IN. = 10 FT.
PLAN
SCALE 1 IN = 40 FT



'ROFILE
CALE 1 IN = 40 FT
CALE 1 IN = 10 FT



PLAN
SCALE 1 IN = 40 FT

National Geodetic Vertical Datum of 1929

HYDRAULIC ELEMENTS						n=.025
STATION	SECTION	SLOPE	Q	Dc		
174+82.62	Trap. B=40'	.00181	15,000	6.10	6.8	12.5
175+00	Trap. B=190'		13,000	5.55	7.2	5.0

SCALE 1 IN = 10 FT
0 5 10 20

SCALE 1 IN = 40 FT
20 0 50 100

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

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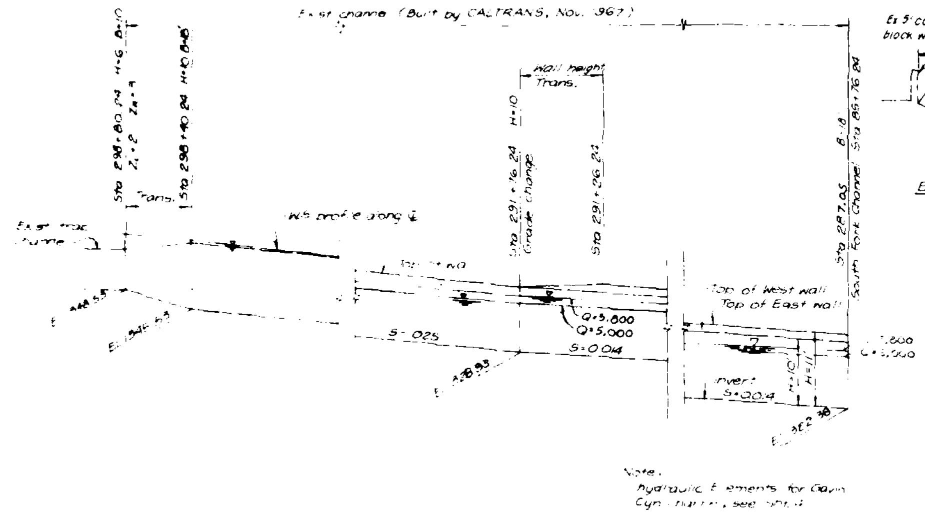
SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

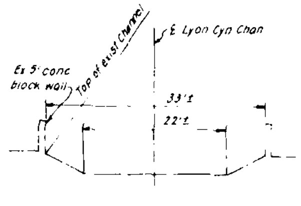
CHANNEL IMPROVEMENT
PLAN AND PROFILE

STA. 175+00 TO STA. 183+29

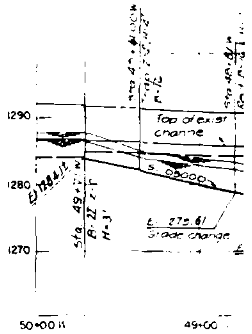
SUBMITTED BY: DATE APPROVED:
SPEC. NO. DACW09- ____ B- ____
DISTRICT FILE NO
SHEET 13 OF 15

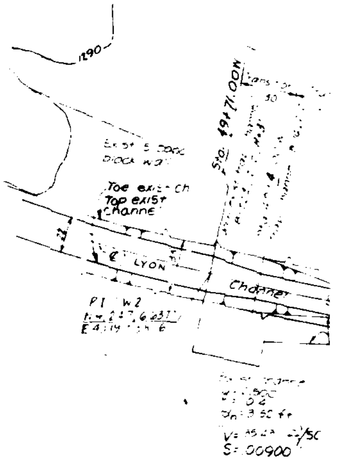


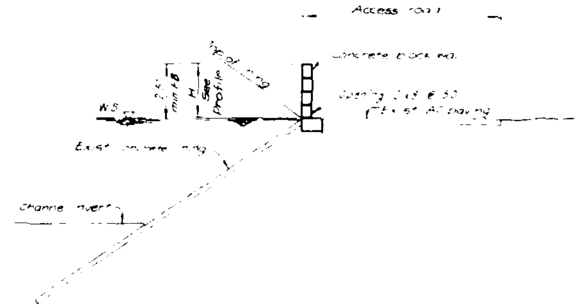
PROFILE (FOR PLAN SEE SH 3 AND 4)
(GAVIN CANYON CHANNEL)
HORIZ SCALE 1 IN = 40 FT
VERT SCALE 1 IN = 10 FT



TYPICAL SECTION
EXIST LYON CYN CHANNEL
N.T.S.

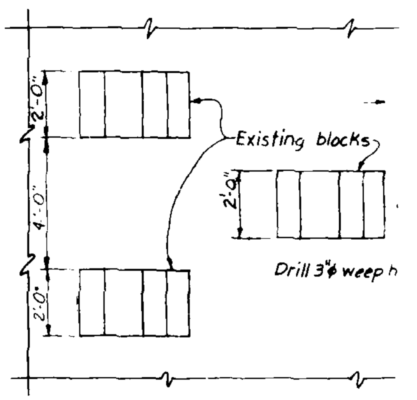




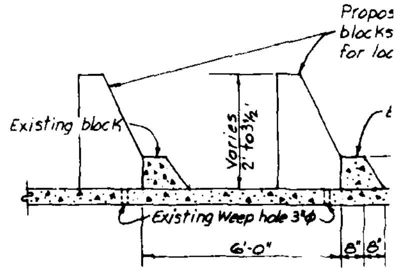


DETAIL (FOR PROFILE SEE SHT. 11, 12 & 13)
CONCRETE BLOCK WALL ON TOP OF EXIST LEVEE
NOT TO SCALE

HYDRAULIC ELEMENTS						
STA	SECTION	SLOPE	Q	Dc	[illegible]	[illegible]
FOR LYON CANYON CHANNEL						
49+71	Trap B=22	.05	2500	[illegible]	[illegible]	[illegible]
49+4	Rect B=16	.05		[illegible]	[illegible]	[illegible]
48+75	Rect B=16	[illegible]		[illegible]	[illegible]	[illegible]
48+20	Rect B=[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
45+02.54	Rect B=9	[illegible]		[illegible]	[illegible]	[illegible]
44+[illegible]	Rect B=9	.028[illegible]		[illegible]	[illegible]	[illegible]

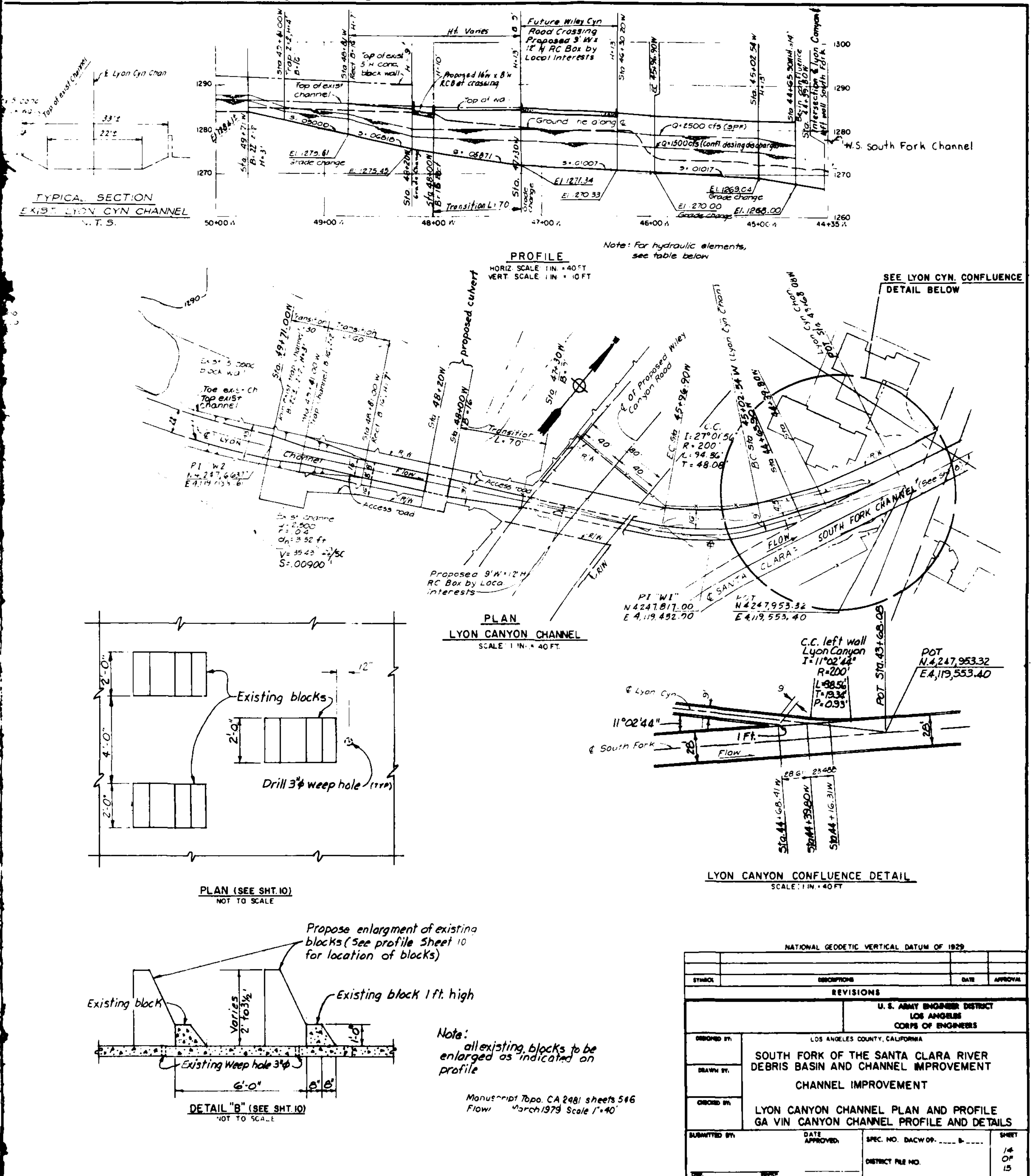


PLAN (SEE SHT 10)
NOT TO SCALE

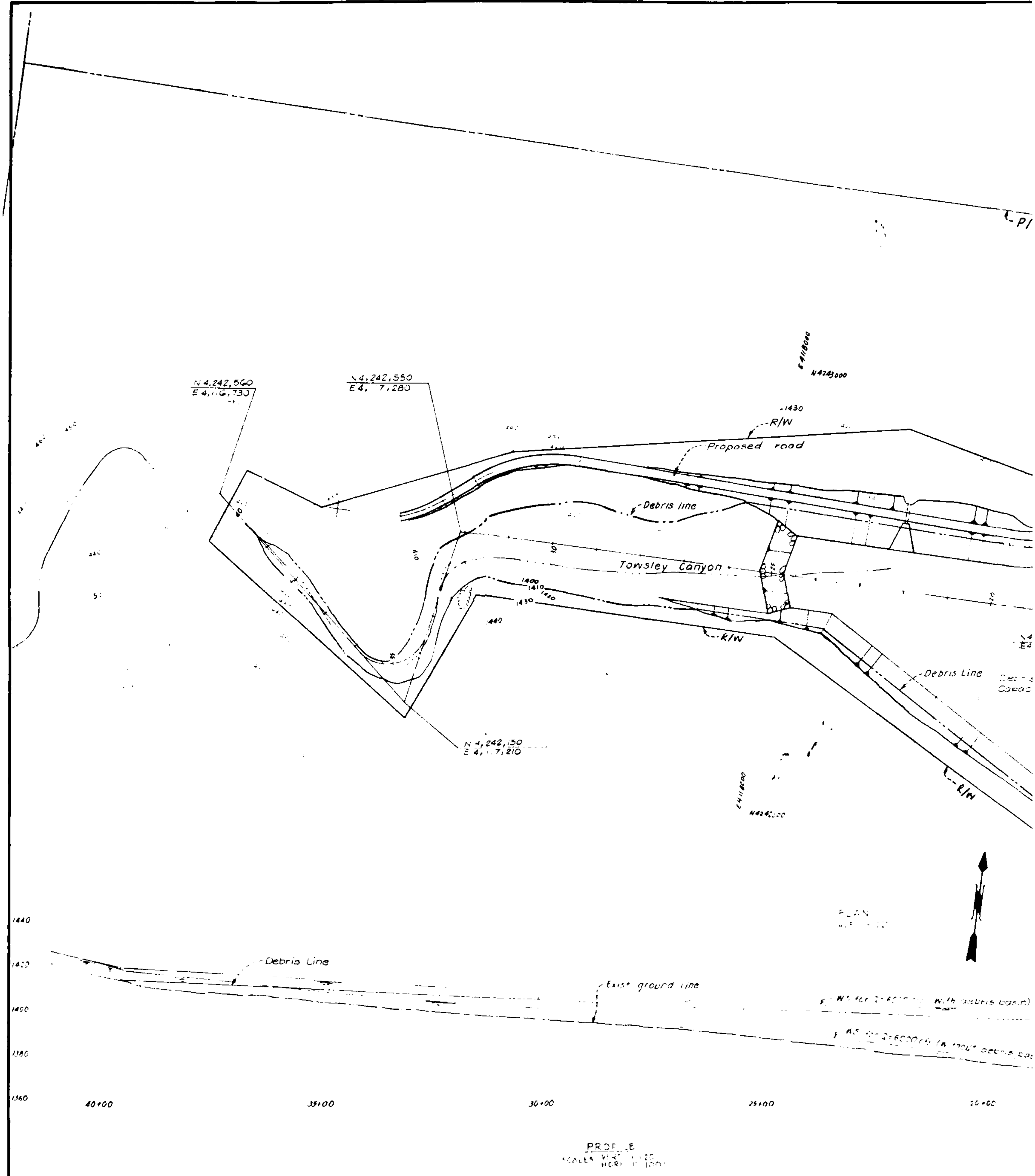


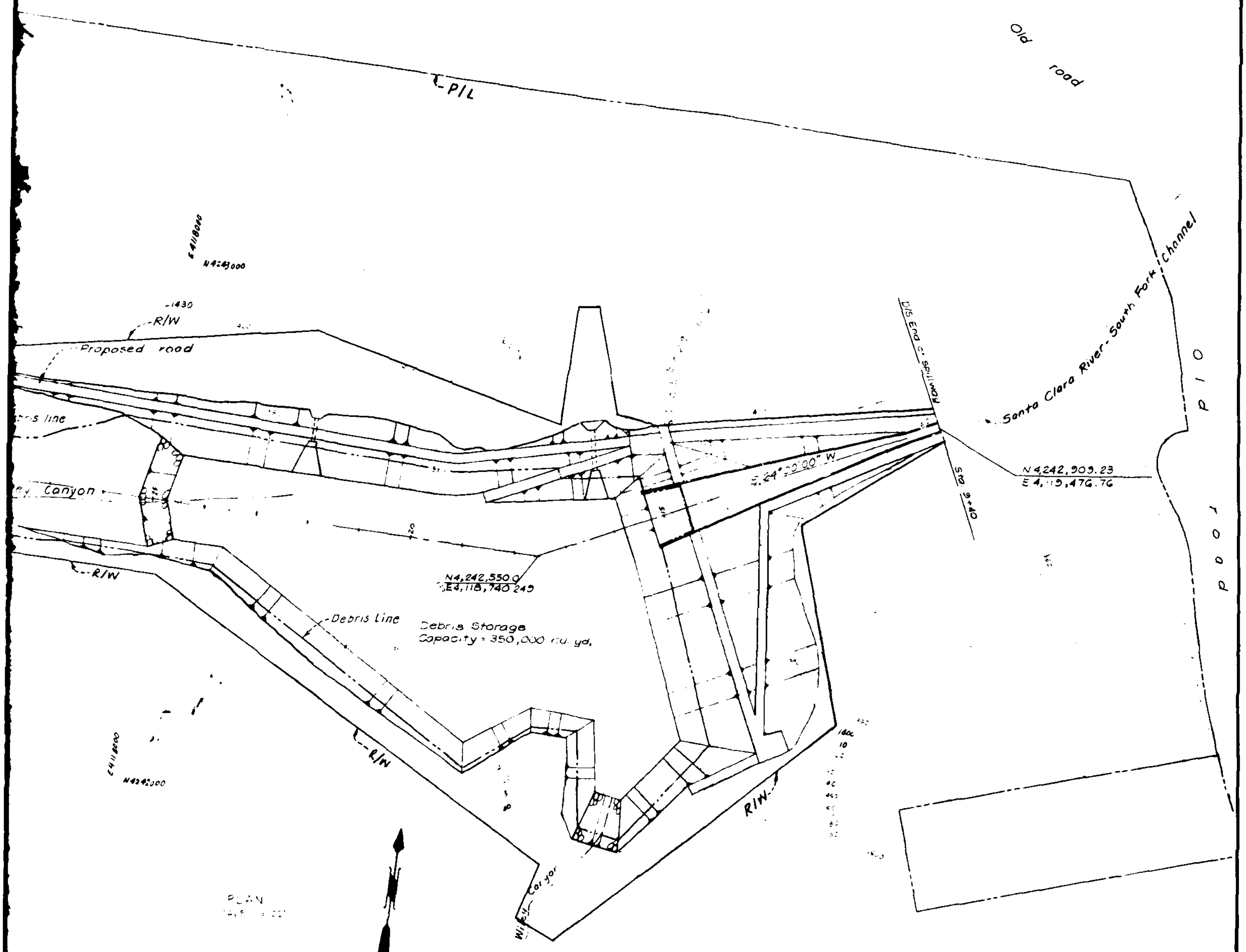
DETAIL "B" (SEE SHT 10)
NOT TO SCALE

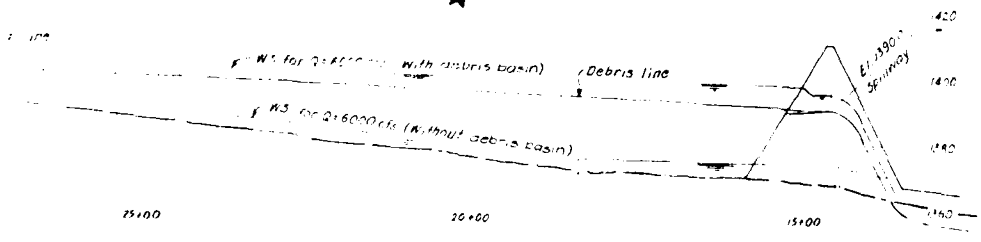
VALUE ENGINEERING PAYS



SAFETY PAYS


N 4,242,560
E 4,1-6,730
N 4,242,550
E 4, 7,280
R/W
Proposed road
Debris line
Towsley Canyon
N 4,242,150
E 4, 7,210
Debris Line
Debris Line
Exist ground line
40+00
35+00
30+00
25+00
PROFILE





SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

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LOS ANGELES
CORPS OF ENGINEERS

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LOS ANGELES COUNTY, CALIFORNIA

SOUTH FORK OF THE SANTA CLARA RIVER
DEBRIS BASIN AND CHANNEL IMPROVEMENT

TOWSLEY DEBRIS BASIN
RIGHT OF WAY PLAN

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DISTRICT FILE NO.

APPENDIX E

HUMAN RESOURCES AND ECONOMIC DEVELOPMENT

NOTE: Appendix E in the January 1983 Detailed Project Report is still considered relevant and, as such, is not being supplemented in this document.

APPENDIX F

ECONOMIC EVALUATION OF

ALTERNATIVE PLANS

DETAILED PROJECT REPORT

FOR FLOOD CONTROL

SOUTH FORK OF THE SANTA CLARA RIVER

SANTA CLARITA VALLEY

CALIFORNIA

January 1985

APPENDIX F

SOUTH FORK OF THE SANTA CLARA RIVER
SANTA CLARITA VALLEY, CALIFORNIA
DETAILED PROJECT REPORT

ECONOMIC EVALUATION OF ALTERNATIVE PLANS

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PLATES

No.	
F-1	Damage-Discharge-Frequency Relationships Project Year 1

APPENDIX F
ECONOMIC EVALUATION OF ALTERNATIVE PLANS

1. This appendix presents an economic evaluation of proposed alternative plans for flood damage reduction on the South Fork of Santa Clara River, in the communities of Newhall and Valencia. Two measures of economic efficiency were used in analyzing the plans: benefit-to-cost ratio and net benefits. The benefit-to-cost ratio indicates whether a given proposal analyzed at the rate of return established by Water Resources Council (8-3/8 percent) would return more in benefits than costs. Net benefits indicate the level of protection that represents the greatest excess of benefits over costs.

METHODOLOGY

2. Estimates of project costs and benefits for each alternative were based on 1984 price levels. Each alternative was assumed to operate for 100 years after its construction; and sufficient allowance was provided for annual operation and maintenance costs to insure the long-range functioning of each project. A 8-3/8 percent discount rate was used to convert construction costs into annual payments over the life of the project; and operation and maintenance costs were added to estimate total annual charges. Each alternative was designed to reduce flood damages and hazards. Flood damages prevented were calculated by comparing damages expected over the 100-year analysis period with and without a project.

PROJECT COST ESTIMATES

First Cost.

3. Estimated project first costs include estimates for construction, interest during construction, engineering and design, supervision and administration, relocations, rights-of-way, beautification, mitigation, recreation, and contingencies. Unit prices were developed by using 1984 material, equipment, and labor costs for basic facilities, and cost for additional land. To appraise land costs, the sites of recommended improvements were inspected and pertaining real estate markets analyzed. The cost of acquiring rights-of-way was based on comparable development. Table F-1 shows first costs of each alternative by project feature and purpose.

Annual Charges.

4. Estimates were made of the time it would take to construct each feature of each alternative. For plans A through D, it was estimated that construction would last 18 months, while for the other plans, construction was estimated at 9 months. Total first costs for alternatives were converted to annual payments by applying the capital recovery factor at the current interest rate of 8-3/8 percent for 100 years. The estimated annual charges for operation and maintenance of the project were added to this annual payment. Annual charges thus include (a) interest on total investment, (b) amortization of the total investment over the project life, and (c) average annual costs of project maintenance and operation. Table F-1 shows the annual charges computed for each project feature of each alternative.

PROJECT BENEFITS

5. Most alternative plans were formulated for a single use of the flood plain resources. Recognition was also given to such nonquantifiable beneficial impacts as the reduction in threat to loss of life, decrease in disease hazards, and cost of severe economic and social dislocation caused by large floods. They are not included in benefits estimates as they are nonquantifiable.

6. All alternatives provide one type of flood control benefit: flood damage or inundation reduction benefits. Flood-damage-reduction are the savings from prevention of direct damages inflicted by floodwaters on real and personal property. Included is reduction of nonphysical losses by residents of the area in terms of lost wages and loss of return on capital investments. Flood-damage-reduction benefits were calculated by comparing damages without any improvement with damages if each alternative plan were in place. Reductions during project life (100 years for all alternatives) was claimed as a benefit.

Flood Damage Reduction.

7. Flood-damage-reduction benefits were estimated by evaluating damages to present (1984) and projected development if no project were constructed and then deducting the damages that would be expected under the same conditions after the project was constructed. Damages are a function of type and value of damageable property, and hydrologic and topographic conditions.

Land Use.

8. The area subject to flooding along the South Fork is primarily composed of urban land uses. Table F-2 shows present and future land use by alternative. A more detailed discussion of land use is in Appendix E.

Present Damageable Property Values.

9. Present (1984) value of development in overflow area was obtained from many sources. Estimates of improvement values for private property were made by (a) sampling development contained in Los Angeles County Tax Assessor's books and adjusting assessed valuation to market value, (b) consulting knowledgeable real estate brokers for valuation data, and (c) field inspections and development appraisals using such references as the Marshall Valuation Service. The Los Angeles District conducted a survey of 18 insurance companies and claims adjusters in the District to determine the value of residential contents; and also contacted the Western Management Science Institute in the UCLA School of Management. Information was sought on homeowners fire insurance policies. These experts were asked specifically about the value of contents in houses that had been completely destroyed to exclude any smoke damage that might skew content damages. They reported that settlement for contents generally ranged from 40 to 60 percent of the structure value: for better homes, the rough estimate was 50 to 60 percent. By some informal sampling in Newhall area, District confirmed these figures. Based on this sampling, the average current value of contents for homes in overflow area was set at approximately 50 percent of structural value. Recent

values obtained for establishments on a square-foot basis were the basis of commercial values; and appropriate governmental agencies furnished public property values. Present values of damageable property are shown by unit value and flood in table F-3.

Future Damageable Property Values.

10. Structural value of future development was assumed to remain the same as current development within overflow area. Approximately 100 new single family units were projected within the current overflow area for alternatives A, B, C, D and F. These units would be protected from the design flood provided by the particular alternative. All development occurring in the 100-yr floodway fringe before construction of the project is assumed to be protected from the 100-year flood.

11. Future value of contents per residence was projected at the OBERS projected rate of increase in personal per-capita income (2.6 percent annually) for Los Angles County. Value of contents was allowed to increase to a maximum of 75 percent of the value of the structure in conformance with Procedures for Evaluation of National Economic Development (NED) Benefits and Costs in Water Resources Planning (Level C). No increase in value of other existing developments was claimed. A summary of estimated present and future value of damageable property in the SPF (with a recurrence interval of about 500 years), 100-year, and 50-year overflow areas is presented in table F-4.

Future Flood Damages Without Project.

12. Hydraulic studies were made to determine the extent of the overflow area, the depth of inundation, and the velocity of flow for each major flood magnitude. Average depth by flood is included in table F-5.

13. Depth-damage relationships were used to evaluate the impact of the anticipated flows on development in the flood plain. These relationships, which were developed for each land-use category from local historical flood-damage reports, have been verified and adjusted for different hydrological conditions after each flood in the Los Angeles District. Depth-damage relationships are shown in table F-6. These depth-damage relationships, when applied to damageable property, were used to develop unit flood damages.

14. Tables F-7 and F-8 show unit damages from various floods, with and without the affluence factor. Unit damages by flood and land use were multiplied by number of units to calculate estimated damage (table F-9).

15. Income losses reflect only loss of return to investments in the flood plain and wages lost to residents.

16. Damages for each type of land use and income losses were summed for each flood. The damage-discharge relationship for year-one conditions is shown on plate F-1.

17. The damages expected to result from each size flood were weighted by the probability of occurrence of that flood by combining the damage-discharge and discharge-frequency curves. Standard damage-frequency integration techniques were used to calculate average annual damages. The discharge-frequency and damage-frequency curves are also shown on plate F-1. Average annual damages and equivalent annual damages (8-3/8 percent, 100-years) are shown for the flood plain in table F-10.

18. Equivalent annual damages were computed next by summing the present worth of the expected annual damages and applying the capital recovery factor (partial payment series) for a 8-3/8 percent discount rate.

Residual Damages.

19. The impact of each alternative plan was evaluated by using the frequency curves associated with the improvements, with adjustments made for new channel capacities. These curves were applied to basic damage-discharge curves. Average annual damages remaining with the project in place were calculated by integrating the "with project" frequency curves and damage-discharge curves. Equivalent annual damages were calculated at a 8-3/8 percent discount rate for a 100-year project life. Probable annual and equivalent annual (8-3/8 percent, 100-year) damages remaining with each alternative are shown in table F-11.

Location Benefits.

20. Location benefits measure increased productivity of land which would have a new use with project. Alternatives A through D and F provide flood protection to 25 acres of land which are presently restricted in development and used for agriculture. If an alternative protected this area from flooding its unimproved value would increase from $837,250 to $4,628,750. This would mean equivalent annual benefits of $317,640.

21. Flood-damage-reduction benefits attributable to each plan were the difference between the damages without the plan and the damages remaining with each alternative. Damages prevented by each alternative are shown in table F-12.

MAXIMIZATION OF NET BENEFITS

22. Net benefits are maximized at that level of protection where the excess of flood control benefits over flood control costs is greatest. The interest rate used in determining annual cost and benefits is 8-3/8 percent.

23. Under present conditions of development, flood control costs for some alternatives would be justified by flood damages prevented. This is demonstrated in table F-1 showing the benefit-to-cost ratio for each alternative.

24. Impact of growth in personal income was measured for present and future development by assuming no growth in damageable residential values. For the sensitivity analysis, contents values were restricted at approximately 50 percent of structure value over the life of the project.

25. Plan B maximizes net NED benefits with $115,000 equivalent annual benefits for protection from the 100-year flood. This qualifies Plan B as the NED plan. The selected plan, A, affords additional flood protection against the SPF flood. In equivalent annual terms, this extra protection costs $83,000 for $32,000 in NED benefits, for a net loss of $51,000. Federal first costs for this project are limited to $4 million. Federal expenditures would be the same with either Plan A or B. The rationale for selecting Plan A instead of the NED plan is explained in the main text.

TABLE F-1

ECONOMIC SUMMARY

South Fork of Santa Clara River
8-3/8%, 100 Year Project Life
(Thousands of October, 1984 Dollars)

	A	B	C	D	E-1	E-2	E-3	E-4	F	G
FIRST COSTS										
Construction	8,215	7,203	8,245	7,730	6,788	5,920	5,060	4,100	11,070	8,280
Interest During Construction	504	448	513	481	208	181	155	126	339	0
Relocations, Bridges	1,150	1,150	2,100	1,150	1,150	1,150	1,240	1,150	1,150	0
Rights-of-way	1,566	1,540	1,930	1,660	1,680	1,640	1,550	1,500	1,520	0
Mitigation	102	102	*	*	*	*	0	0	0	0
TOTAL FIRST COST	11,435	10,443	12,788	11,021	9,826	8,891	8,005	6,876	14,079	8,280
ANNUAL CHARGES										
Interest & Amortization	958	875	1,071	923	823	745	671	576	1,180	694
Operation, Maintenance & Repair (flood control)	80	80	90	80	80	80	70	70	80	40
Operation, Maintenance & Repair (mitigation)	5	5	0	0	0	0	0	0	0	0
TOTAL ANNUAL CHARGES	1,043	960	1,161	1,003	903	825	741	646	1,260	755
ANNUAL BENEFITS										
Damages Prevented	705	673	673	673	706	673	706	673	705	507
Reduced Channel Maintenance	50	50	50	50	50	50	45	45	50	0
Location Benefits	318	318	318	318	0	0	0	0	318	0
Bridge Cost Savings	34	34	34	34					34	
TOTAL ANNUAL BENEFITS	1,107	1,075	1,075	1,075	756	723	751	718	1,107	507
B/C FUTURE CONDITIONS	1.1	1.1	.93	1.1	0.8	0.80	1.01	1.1	0.88	0.7
NET BENEFITS	64	115	-86	72	-147	-102	10	72	-153	-248

* Minimal amount - less than $3000

TABLE F-2

Units of Land Use Within Existing Overflows,
South Fork of Santa Clara River

	1984	1985	1995[1]	1995[2]
	Standard Project and 500-Year Floods			
RESIDENTIAL				
1 Story Single Family	627	627	627	727
2 Story Single Family	166	166	166	166
Mobile Homes	36	36	36	36
COMMERCIAL				
Strip	9	9	9	9
Markets	2	2	2	2
Restaurants	2	2	2	2
PUBLIC				
Schools	1	1	1	1
Total	843	843	843	943
	100-YEAR FLOOD			
RESIDENTIAL				
1 Story Single Family	533	533	533	633
2 Story Single Family	145	145	145	145
Mobile Homes	36	36	36	36
COMMERCIAL				
Strip	9	9	9	9
Markets	2	2	2	2
Restaurants	2	2	2	2
PUBLIC				
School	1	1	1	1
Total	728	728	728	828
	50-YEAR FLOOD			
RESIDENTIAL				
1 Story Single Family	521	521	521	621
2 Story Single Family	140	140	140	140
Mobile Homes	36	36	36	36
COMMERCIAL				
Strip	9	9	9	9
Markets	2	2	2	2
Restaurants	2	2	2	2
PUBLIC				
Schools	1	1	1	1
Total	711	711	711	811

1. Without project condition and with alternative E1, E2, [illegible]
2. With project alternatives A, B, C, D, and F.

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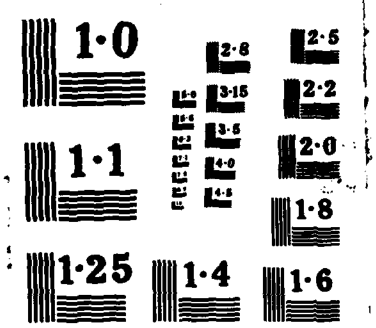
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TABLE F-2

Units of Land Use Within Existing Overflows,
South Fork of Santa Clara River

	1984	1985	1995[1]	1995[2]
	Standard Project and 500-Year Floods			
RESIDENTIAL				
1 Story Single Family	627	627	627	727
2 Story Single Family	166	166	166	166
Mobile Homes	36	36	36	36
COMMERCIAL				
Strip	9	9	9	9
Markets	2	2	2	2
Restaurants	2	2	2	2
PUBLIC				
Schools	1	1	1	1
Total	843	843	843	943
	100-YEAR FLOOD			
RESIDENTIAL				
1 Story Single Family	533	533	533	633
2 Story Single Family	145	145	145	145
Mobile Homes	36	36	36	36
COMMERCIAL				
Strip	9	9	9	9
Markets	2	2	2	2
Restaurants	2	2	2	2
PUBLIC				
School	1	1	1	1
Total	728	728	728	828
	50-YEAR FLOOD			
RESIDENTIAL				
1 Story Single Family	521	521	521	621
2 Story Single Family	140	140	140	140
Mobile Homes	36	36	36	36
COMMERCIAL				
Strip	9	9	9	9
Markets	2	2	2	2
Restaurants	2	2	2	2
PUBLIC				
Schools	1	1	1	1
Total	711	711	711	811

1. Without project condition and with alternative E1, E2, E3, E4 and G.
2. With project alternatives A, B, C, D, and F.

TABLE F-3

South Fork of Santa Clara River
1984 Unit Values in Flood Plain by Flood and Property Type
(Thousands of Dollars)

	Average Value Structure	Average Value Contents	Contents % of Structure	Average Value of Structure and Contents
STANDARD PROJECT AND 500-YEAR FLOODS				
RESIDENTIAL				
1 Story Single Family	66.8	29.3	45	
2 Story Single Family	140.3	61.6	45	
Mobile Homes	28.3	13.9	50	
COMMERCIAL				
Strip				255.8
Markets				856.2
Restaurants				357.2
PUBLIC				
Schools				1576.3
100-YEAR FLOOD				
RESIDENTIAL				
1 Story Single Family	61.9	27.2	45	
2 Story Single Family	140.9	61.8	45	
Mobile Homes	28.3	13.9	50	
COMMERCIAL				
Strip				255.8
Markets				856.2
Restaurants				375.2
PUBLIC				
Schools				1576.3
50-YEAR FLOOD				
RESIDENTIAL				
1 Story Single Family	61.9	27.2	45	
2 Story Single Family	143.8	63.2	45	
Mobile Homes	28.3	13.9	50	
COMMERCIAL				
Strip				255.8
Markets				856.2
Restaurants				357.2
PUBLIC				
Schools				1576.3

TABLE F-4

South Fork of Santa Clara River
Present and Future Value of Property in Flood Plain
by Land Use, Flood, and Decade
(Without Project)
(Thousands of Dollars)

	1984	1985	1995	2005-2085
	STANDARD PROJECT AND 500-YEAR FLOODS			
RESIDENTIAL				
1 Story Single Family (Structures)	41866	41866	41866	41866
1 Story Single Family (Contents)	19866	20384	26342	30654
2 Story Single Family (Structures)	23284	23284	23284	23284
2 Story Single Family (Contents)	11057	11334	14650	17046
Mobile Homes (Structures)	1021	1021	1021	1021
Mobile Homes (Contents)	538	549	717	750
COMMERCIAL				
Strip	2302	2302	2302	2302
Markets	1712	1712	1712	1712
Restaurants	714	714	714	714
PUBLIC				
Schools	1576	1576	1576	1576
Total	103956	104742	114184	120925
	100-YEAR FLOOD			
RESIDENTIAL				
1 Story Single Family (Structures)	33034	33034	33034	33034
1 Story Single Family (Contents)	15691	16083	20787	24192
2 Story Single Family (Structures)	20417	20417	20417	20417
2 Story Single Family (Contents)	9702	9946	12846	14952
Mobile Homes (Structures)	1021	1021	1021	1021
Mobile Homes (Contents)	538	549	717	750
COMMERCIAL				
Strip	2302	2302	2302	2302
Markets	1712	1712	1712	1712
Restaurants	714	714	714	714
PUBLIC				
Schools	1576	1576	1576	1576
Total	86707	87354	95126	100670

1. Single Family Content values increase for 20 years beyond 1981, based upon 2.6% annual growth (OBERS) from 45% to 75% of structural value. Mobile home contents increase for 16 years at the same rate from 50% to 75% of structural value.

TABLE F-4 (Continued)

	1984	1985	1995	2005-2085
		50-YEAR FLOOD		
RESIDENTIAL				
1 Story Single Family (Structures)	32265	32256	32265	32265
1 Story Single Family (Contents)	15330	15714	20306	23632
2 Story Single Family (Structures)	20130	20130	20130	20130
2 Story Single Family (Contents)	9562	9800	12678	14739
Mobile Homes (Structures)	1021	1021	1021	1021
Mobile Homes (Contents)	538	549	717	750
COMMERCIAL				
Strip	2302	2302	2302	2302
Markets	1712	1712	1712	1712
Restaurants	714	714	714	714
PUBLIC				
Schools	1576	1576	1576	1576
Total	85150	85485	93421	98841

TABLE F-5

South Fork of the Santa Clara River
Average Interior Depth of Inundation
Flood and Land Use w/o Project
(In Feet)

	Standard Project and 500-Year Floods	100-Year Flood	50-Year Flood
LAND USE			
RESIDENTIAL			
1 Story Single Family	2.14	1.41	1.07
2 Story Single Family	1.98	1.14	0.83
Mobile Homes	2.00	1.00	0.5
COMMERCIAL			
Strip	2.0	1.0	0.5
Markets	2.0	1.0	0.9
Restaurants	2.0	1.0	0.5
PUBLIC			
Schools	2.0	1.0	0.5

TABLE F-6

South Fork of the Santa Clara River

Selected Depth-Damage Relationships
(Percent Damage, Interior depth)

Land Use/Depth	(Feet) 0	1	2	3	4-5
RESIDENTIAL					
1 Story Single Family (Structures)	0.3	10.4	17.0	32.0	38.0
1 Story Single Family (Contents)	0	7.2	16.0	30.0	32.0
2 Story Single Family (Structures)	0.1	6.0	9.5	16.0	19.0
2 Story Single Family (Contents	0	4.3	9.6	17.5	19.0
Mobile Homes (Structures)	0.1	6.0	9.5	16.0	19.0
Mobile Homes (Contents)	0	7.2	16.0	30.0	32.0
COMMERCIAL					
Strip (Structures)	0.2	10.0	13.7	21.2	26.4
Strip (Contents)	0	6.0	20.0	37.5	42.0
Market (Structures)	0.2	10.0	13.7	21.2	26.4
Market (Contents)	0	7.0	15.0	20.0	25.0
Restaurant (Structures)	0.2	10.0	13.7	21.2	26.4
Restaurant (Contents)	0	7.0	15.0	20.0	25.0
PUBLIC					
Schools (Structures)	0.2	10.0	13.7	21.2	26.4
Schools (Contents)	0	6.0	20.0	37.5	42.0

TABLE F-7

South Fork of the Santa Clara River

Incremental Increase in Unit Damages From Affluence Factor
by Flood and Land Use
(Thousands of Dollars)

	1984	1985	1995	2005	2015	2025-85
STANDARD PROJECT AND & 500-YEAR FLOODS						
RESIDENTIAL						
1 Story Single Family	0	0.2	1.5	1.4	0	0
2 Story Single Family	0	0.3	1.8	1.8	0	0
Mobile Homes	0	0.1	0.7	0.2	0	0
100-YEAR FLOOD						
RESIDENTIAL						
1 Story Single Family	0	0.1	0.8	0.7	0	0
2 Story Single Family	0	0.1	0.9	0.9	0	0
Mobile Homes	0	0	0.3	0.1	0	0
50-YEAR FLOOD						
RESIDENTIAL						
1 Story Single Family	0	0	0.6	0.6	0	0
2 Story Single Family	0	0.1	0.9	0.5	0	0
Mobile Homes	0	0	0.1	0	0	0

TABLE F-8

South Fork of the Santa Clara River

Unit Damages With Affluence Factor
(Thousands of Dollars)

	1984	1985	1995	2005-2085
STANDARD PROJECT AND & 500-YEAR FLOODS				
RESIDENTIAL				
1 Story Single Family	18.5	18.5	20.1	21.7
2 Story Single Family	22.0	22.0	24.0	26.0
Mobile Homes	5.0	5.0	5.7	6.0
COMMERCIAL				
Strip	42.3	42.3	42.3	36.6
Markets	124.2	124.2	124.2	124.2
Restaurants	57.3	57.3	57.3	57.3
PUBLIC				
Schools	255.0	255.0	255.0	255.0
100-YEAR FLOOD				
RESIDENTIAL				
1 Story Single Family	10.0	10.0	10.8	11.6
2 Story Single Family	12.0	12.0	12.9	14.0
Mobile Homes	2.7	2.7	3.1	3.2
COMMERCIAL				
Strip	21.3	21.3	21.3	21.3
Markets	69.7	69.7	69.7	69.7
Restaurants	30.6	30.6	30.6	30.6
PUBLIC				
Schools	132.7	132.7	132.7	132.7
50-YEAR FLOOD				
RESIDENTIAL				
1 Story Single Family	7.8	7.8	8.4	9.0
2 Story Single Family	9.4	9.4	10.2	10.9
Mobile Homes	1.6	1.6	1.7	1.7
COMMERCIAL				
Strip	17.0	17.0	17.0	17.0
Markets	57.8	57.8	57.8	57.8
Restaurants	26.1	26.1	26.1	26.1
PUBLIC				
Schools	85.1	85.1	85.1	85.1

TABLE F-9

South Fork of the Santa Clara River

Damages By Flood, Decade And Land Use
(Thousands of Dollars)

	1984	1985	1995	2005-2085
STANDARD PROJECT AND 500-YEAR FLOODS				
RESIDENTIAL				
1 Story Single Family (Structures)	8372	8372	8372	8372
1 Story Single Family (Contents)	3252	3293	4257	5215
2 Story Single Family (Structures)	2583	2583	2583	2583
2 Story Single Family (Contents)	1080	1092	1411	1729
Mobile Homes Structures)	97	97	97	97
Mobile Homes (Contents)	81	82	105	116
COMMERCIAL				
Strip	381	381	381	381
Markets	248	248	248	248
Restaurants	115	115	115	115
PUBLIC				
Schools	255	255	255	255
Utilities	379	379	379	379
Roads	194	194	194	194
INCOME LOSSES AND EMERGENCY COSTS	439	439	439	439
Total	17485	17530	18836	20123
100-YEAR FLOOD				
RESIDENTIAL				
1 Story Single Family (Structures)	3965	3965	3965	3965
1 Story Single Family (Contents)	1375	1392	1800	2205
2 Story Single Family (Structures)	1277	1277	1277	1277
2 Story Single Family (Contents)	463	469	606	743
Mobile Homes (Structures)	62	62	62	62
Mobile Homes (Contents)	37	37	48	53

TABLE F-9 (Continued)

	1984	1985	1995	2005-2085
		100-YEAR FLOOD (Continued)		
COMMERCIAL				
Strip	192	192	192	192
Markets	139	139	139	139
Restaurants	61	61	61	61
PUBLIC				
Schools	133	133	133	133
Utilities	315	315	315	315
Roads	169	169	169	169
INCOME LOSSES AND EMERGENCY COSTS	271	271	271	271
Total	8459	8482	9038	9585
		50-YEAR FLOOD		
RESIDENTIAL				
1 Story Single Family (Structures)	3019	3019	3019	3019
1 Story Single Family (Contents)	1036	1049	1356	1662
2 Story Single Family (Structures)	976	976	976	976
2 Story Single Family (Contents)	347	352	455	556
Mobile Homes (Structures)	40	40	40	40
Mobile Homes (Contents)	17	17	21	22
COMMERCIAL				
Strip	153	153	153	153
Markets	116	116	116	116
Restaurants	52	52	52	52
PUBLIC				
Schools	85	85	85	85
Utilities	252	252	252	252
Roads	136	136	136	136
INCOME LOSSES AND EMERGENCY COSTS	227	227	227	227
Total	6456	6474	6888	7296

TABLE F-10

South Fork of the Santa Clara River

Probable and Equivalent Annual Damages Without Project
(Thousands of Dollars)

	1984	1985	1995	2005	2015	2025-85	Equivalent Annual At 8-3/8% 100-Yr
RESIDENTIAL							
1 Story Single Family (Structures)	312	312	312	312	312	312	312
1 Story Single Family (Contents)	109	110	142	175	175	175	146
2 Story Single Family (Structures)	101	101	101	101	101	101	101
2 Story Single Family (Contents)	37	37	48	58	58	58	48
Mobile Homes (Structures)	3	3	3	3	3	3	3
Mobile Homes (Contents)	2	2	2	2	2	2	2
COMMERCIAL							
Strip	15	15	15	15	15	15	15
Markets	11	11	11	11	11	11	11
Restaurants	5	5	5	5	5	5	5
PUBLIC							
Schools	9	9	9	9	9	9	9
Utilities	24	24	24	24	24	24	24
Roads	13	13	13	13	13	13	13
INCOME LOSSES AND EMERGENCY COSTS	21	21	21	21	21	21	21
Total	662	663	706	749	749	749	710

TABLE F-11

South Fork of the Santa Clara River

Probable and Equivalent Annual Residual Damages By Alternative
(Thousands of Dollars)

	1984	1985	1995	2005	2015	2025-85	Equivalent Annual At 8-3/8% 100-Yr
	Alternatives A and F						
RESIDENTIAL							
1 Story Single Family (Structures)	3	3	3	3	3	3	3
1 Story Single Family (Contents)	1	1	1	1	1	1	1
2 Story Single Family (Structures)	1	1	1	1	1	1	1
2 Story Single Family (Contents)	0	0	0	0	0	0	0
Mobile Homes (Structures)	0	0	0	0	0	0	0
Mobile Homes (Contents)	0	0	0	0	0	0	0
COMMERCIAL							
Strip	0	0	0	0	0	0	0
Markets	0	0	0	0	0	0	0
Restaurants	0	0	0	0	0	0	0
PUBLIC							
Schools	0	0	0	0	0	0	0
Utilities	0	0	0	0	0	0	0
Roads	0	0	0	0	0	0	0
INCOME LOSSES AND EMERGENCY COSTS	0	0	0	0	0	0	0
Total	5	5	5	5	5	5	5

TABLE F-11 (Continued)

	1984	1985	1995	2005	2015	2025-85	Equivalent Annual At 8-3/8% 100-Yr
	Alternatives B, C, D, E-2, and E-4						
RESIDENTIAL							
1 Story Single Family (Structures)	18	18	18	18	18	18	18
1 Story Single Family (Contents)	6	6	8	10	10	10	8
2 Story Single Family Structures)	5	5	5	5	5	5	5
2 Story Single Family (Contents)	2	2	2	3	3	3	3
Mobile Homes (Structures)	0	0	0	0	0	0	0
Mobile Homes (Contents)	0	0	0	0	0	0	0
COMMERCIAL							
Strip	0	0	0	0	0	0	0
Markets	0	0	0	0	0	0	0
Restaurants	0	0	0	0	0	0	0
PUBLIC							
Schools	0	0	0	0	0	0	0
Utilities	1	1	1	1	1	1	1
Roads	1	1	1	1	1	1	1
INCOME LOSSES AND EMERGENCY COSTS	1	1	1	1	1	1	1
Total	34	34	36	39	39	39	37

TABLE F-11 (Continued)

	1984	1985	1995	2005	2015	2025-85	Equivalent Annual At 8-3/8% 100 Yr
	Alternative E-1 and E-3						
RESIDENTIAL							
1 Story Single Family (Structures)	2	2	2	2	2	2	2
1 Story Single Family (Contents)	1	1	1	1	1	1	1
2 Story Single Family (Structures)	1	1	1	1	1	1	1
2 Story Single Family (Contents)	0	0	0	0	0	0	0
Mobile Homes (Structures)	0	0	0	0	0	0	0
Mobile Homes (Contents)	0	0	0	0	0	0	0
COMMERCIAL							
Strip	0	0	0	0	0	0	0
Markets	0	0	0	0	0	0	0
Restaurants	0	0	0	0	0	0	0
PUBLIC							
Schools	0	0	0	0	0	0	0
Utilities	0	0	0	0	0	0	0
Roads	0	0	0	0	0	0	0
INCOME LOSSES AND EMERGENCY COSTS	0	0	0	0	0	0	0
Total	4	4	4	4	4	4	4

TABLE F-11 (Continued)

	1984	1985	1995	2005	2015	2025-85	Equivalent Annual At 8-3/8% 100-Yr
Alternative G							
RESIDENTIAL							
1 Story Single Family (Structures)	92	92	92	92	92	92	92
1 Story Singel Family (Contents)	32	32	41	50	50	50	41
2 Story Single Family (Structures)	30	30	30	30	30	30	30
2 Story Single Family (Contents)	12	12	13	17	17	17	15
Mobile Homes (Structures)	1	1	1	1	1	1	1
Mobile Homes (Contents)	1	1	1	1	1	1	1
COMMERCIAL							
Strip	3	3	3	3	3	3	3
Markets	2	2	2	2	2	2	2
Restaurants	1	1	1	1	1	1	1
PUBLIC							
Schools	2	2	2	2	2	2	2
Utilities	7	7	7	7	7	7	7
Roads	2	2	2	2	2	2	2
INCOME LOSSES AND EMERGENCY COSTS	6	6	6	6	6	6	6
Total	191	191	201	214	214	214	203

TABLE F-12

South Fork of the Santa Clara River

Probable and Equivalent Annual Damages Prevented By Alternative
(Thousands of Dollars)

	1984	1985	1995	2005	2015	2025-85	Equivalent Annual At 8-3/8% 100-Yr
				Alternatives A and F			
RESIDENTIAL							
1 Story Single Family (Structures)	309	309	309	309	309	309	309
1 Story Single Family (Contents)	106	107	141	174	174	174	145
2 Story Single Family (Structures)	100	100	100	100	100	100	100
2 Story Single Family (Contents)	39	40	47	57	57	57	48
Mobil Homes (Structures)	3	3	3	3	3	3	3
Mobil Homes (Contents)	2	2	2	2	2	2	2
COMMERCIAL							
Strip	15	15	15	15	15	15	15
Markets	11	11	11	11	11	11	11
Restaurants	5	5	5	5	5	5	5
PUBLIC							
Schools	9	9	9	9	9	9	9
Utilities	24	24	24	24	24	24	24
Roads	13	13	13	13	13	13	13
INCOME LOSSES AND EMERGENCY COSTS	21	21	21	21	21	21	21
Total	657	659	700	743	743	743	705

TABLE F-12 (Continued)

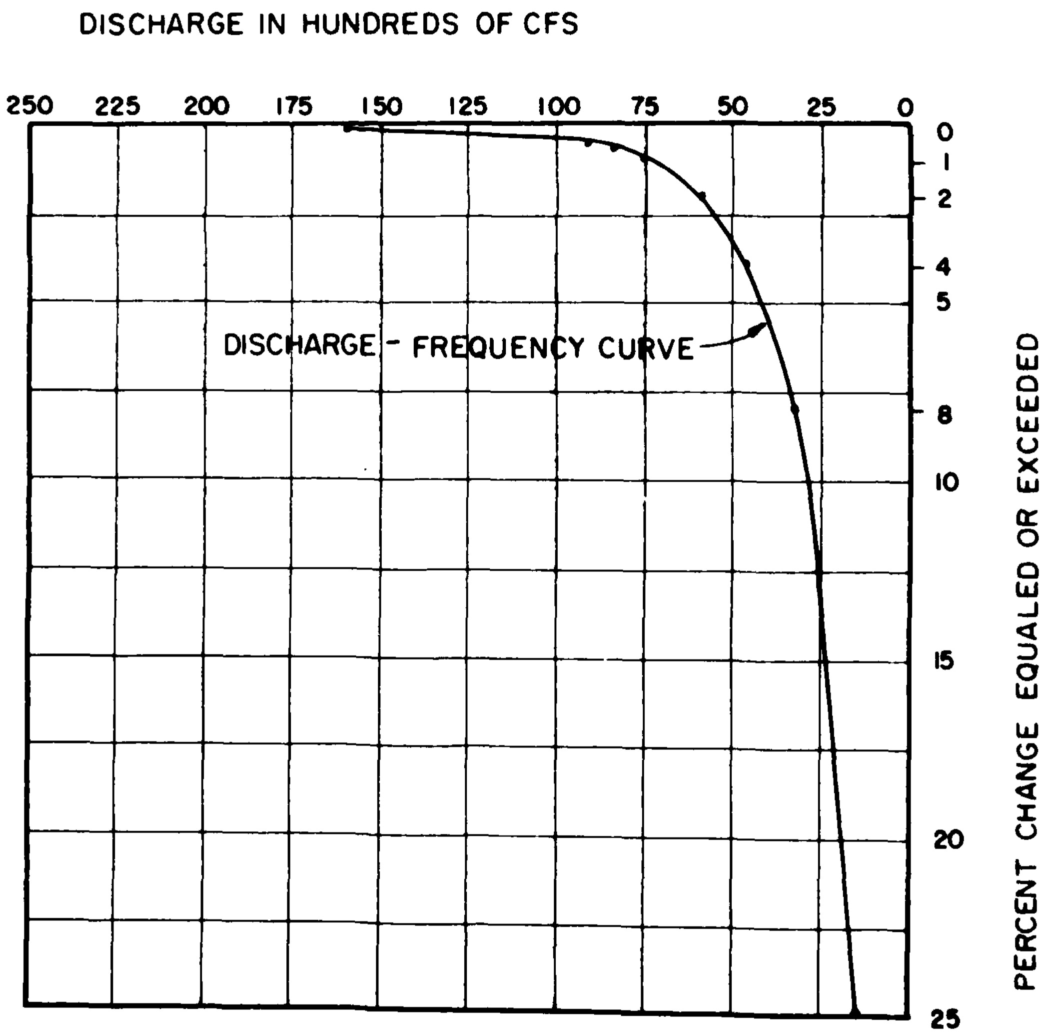
	1984	1985	1995	2005	2015	2025-85	Equivalent Annual At 8-3/8% 100-Yr
	Alternatives B, C, D, E-2, E-4						
RESIDENTIAL							
1 Story Single Family (Structures)	294	294	294	294	294	294	294
1 Story Single Family (Contents)	103	104	134	166	166	166	138
2 Story Single Family (Structures)	96	96	96	96	96	96	96
2 Story Single Family (Contents)	35	35	46	55	55	55	45
Mobile Homes (Structures)	3	3	3	3	3	3	3
Mobile Homes (Contents)	2	2	2	2	2	2	2
COMMERCIAL							
Strip	15	15	15	15	15	15	15
Markets	11	11	11	11	11	11	11
Restaurants	5	5	5	5	5	5	5
PUBLIC							
Schools	9	9	9	9	9	9	9
Utilities	23	23	23	23	23	23	23
Roads	12	12	12	12	12	12	12
INCOME LOSSES AND EMERGENCY COSTS	20	20	20	20	20	20	20
Total	628	629	670	711	711	711	673

TABLE F-12 (Continued)

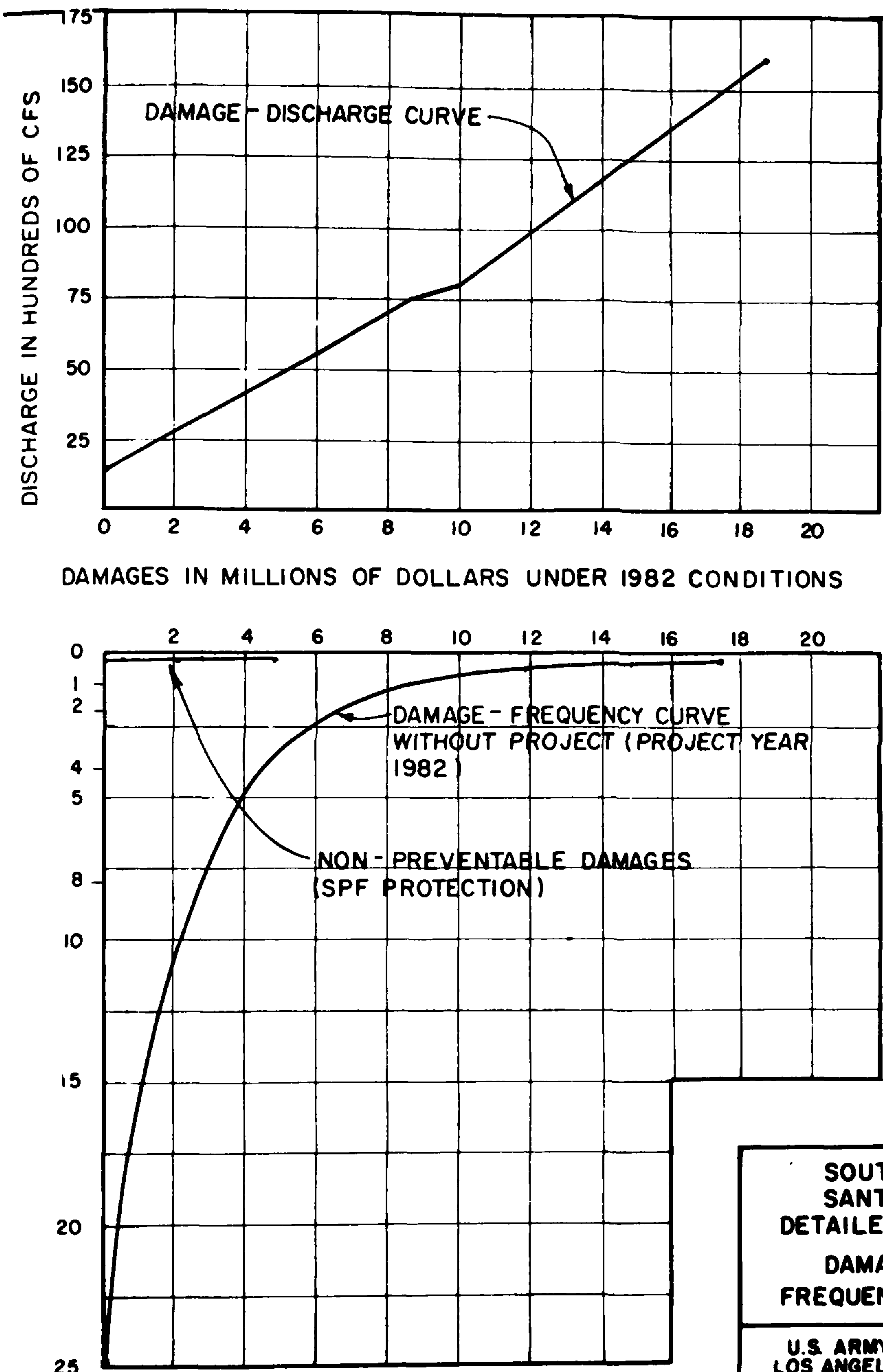
	1984	1985	1995	2005	2015	2025-85	Equivalent Annual At 8-3/8% 100 Yr
	Alternatives E-1 and E-3						
RESIDENTIAL							
1 Story Single Family (Structures)	310	310	310	310	310	310	310
1 Story Single Family (Contents)	108	109	141	174	174	174	145
2 Story Single Family (Structures)	100	100	100	100	100	100	100
2 Story Single Family (Contents)	37	37	48	58	58	58	48
Mobile Homes (Structures)	3	3	3	3	3	3	3
Mobile Homes (Contents)	2	2	2	2	2	2	2
COMMERCIAL							
Strip	15	15	15	15	15	15	15
Markets	11	11	11	11	11	11	11
Restaurants	5	5	5	5	5	5	5
PUBLIC							
Schools	9	9	9	9	9	9	9
Utilities	24	24	24	24	24	24	24
Roads	13	13	13	13	13	13	13
INCOME LOSSES AND EMERGENCY COSTS	21	21	21	21	21	21	21
Total	658	659	702	745	745	745	706

TABLE F-12 (Continued)

	1984	1985	1995	2005	2015	2025-85	Equivalent Annual At 8-3/8% 100-Yr
			Alternative G				
RESIDENTIAL							
1 Story Single Family (Structures)	220	220	220	220	220	220	220
1 Story Single Family (Contents)	77	78	101	124	124	124	104
2 Story Single Family (Structures)	71	71	71	71	71	71	71
2 Story Single Family (Contents)	25	25	35	41	41	41	33
Mobile Homes (Structures)	2	2	2	2	2	2	2
Mobile Homes (Contents)	1	1	1	1	1	1	1
COMMERCIAL							
Strip	12	12	12	12	12	12	12
Markets	9	9	9	9	9	9	9
Restaurants	4	4	4	4	4	4	4
PUBLIC							
Schools	7	7	7	7	7	7	7
Utilities	17	17	17	17	17	17	17
Roads	11	11	11	11	11	11	11
INCOME LOSSES AND EMERGENCY COSTS	15	15	15	15	15	15	15
Total	471	472	505	534	534	534	507



DISCHARGE IN HUNDREDS OF CFS
250
225
200
175
150
125
100
75
50
25
0
DISCHARGE - FREQUENCY CURVE
0
1
2
4
5
8
10
15
20
25
PERCENT CHANGE EQUALED OR EXCEEDED



SOUTH FORK OF THE
SANTA CLARA RIVER
DETAILED PROJECT REPORT

DAMAGE - DISCHARGE
FREQUENCY RELATIONSHIP

U.S. ARMY ENGINEERS DISTRIST
LOS ANGELES, CORPS OF ENGINEERS

PLATE F-1

APPENDIX G

ENVIRONMENTAL APPENDIX

TO THE

FINAL SUPPLEMENTAL REPORT

SOUTH FORK OF THE SANTA CLARA RIVER

JANUARY 1985

APPENDIX G

SOUTH FORK OF THE SANTA CLARA RIVER
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List of References

Final Detailed Project Report for Flood Control and Allied Purposes, South Fork of the Santa Clara River, Los Angeles County, California, January 1983

Santa Clarita Valley Areawide General Plan: 16 February 1984

Personal Communications:

Los Angeles County Flood Control District, Bill Higley: 9 October 1980
Biologist, John Atwood: 6 June 1984
Soil Conservation Service, David Estrada: 6 September 1984
Los Angeles County Regional Planning Subdivision Section, Mr. Lackner: 13 September 1984
Valencia Water Company, Dick Hackney: 14 September 1984
Newhall City Water Company, Jim Jinks: 14 September 1984
Santa Clarita Water Company, Dennis Ross: 14 September 1984
U.S. Fish and Wildlife Service, Endangered Species Office, Jack Williams: 19 September 1984

United States
Department of
Agriculture

Soil
Conservation
Service

1523 East Valley Parkway, Suite 213
Escondido, CA 92027
Phone: 489-1959

April 22, 1981

Mr. Robert S. Joe, Chief
Environmental Resources Branch
U.S. Army Corps of Engineers
Los Angeles District
P.O. Box 2711
Los Angeles, CA 90053

Dear Mr. Joe:

We acknowledge receipt of the subject material concerning identification of Prime and Unique soils in the South Fork Santa Clara River. Enclosed is the information requested, YOA and YOBC are considered to be prime soils. A small area at the south tip of the proposed project is MhF2, this soil is not prime nor unique.

Enclosed is also, a list of characteristics and qualities for the above mentioned soils and a soils map showing the proposed project.

Please keep in mind that this survey was done in 1966 and it is possible that some land is already developed.

David C. Estudia
for JACK F. SMITH
Area Conservationist

encl

bb

TABLE I
SOIL CHARACTERISTICS AND QUALITIES
SAUGUS - NEWHALL AREA

MAP SYMBOL	AREA (acres)	EXTENT (percent)	SOIL NAME	CAP UNIT	POSITION	SOIL PROFILE (dry) Surface Layer	Subsoil	Substratum or Parent Material	NAT DRAIN	SUBSOIL PERM	RUNOFF	EROSION HAZARD	EFF DEPTH (in.)	A W C (in)	FERTIL-ITY	PRESENT USE
VtF2	493	0.3	Vista coarse sandy loam, 30 to 65 percent slopes	VIIel	Steep to very steep mountainous uplands	Grayish brown, massive, hard, pH 6.1-6.5, 10 to 14"	Brown, coarse sandy loam, massive, hard, pH 6.6-7.4, 14 to 24"	Acid granitic rock at 24 to 36"	Well	Moderately Rapid	Medium to Rapid	High	24 - 36	2.5 - 3.5	Low	Range
YsA	105	1/	Yolo sandy loam, 0 to 2 percent slopes	I	Nearly level alluvial fans	Brown, massive, hard, pH 6.1-6.5, 14 to 16"	Grayish brown loam, massive, hard, pH 6.6-7.3, 18 to 22"	Yellowish brown loam, massive, hard, pH 6.6-7.3, 22 to 28"+	Well	Moderate	Medium	Slight	60+	9 - 10	High	Alfalfa truck crops
YsBC	144	1/	Yolo sandy loam, 2 to 9 percent slopes	IIel	Gently to moderately sloping alluvial fans	Brown, massive, hard, pH 6.1-6.5, 14 to 16"	Grayish brown loam, massive, hard, pH 6.6-7.3, 18 to 22"	Yellowish brown loam, massive, hard, pH 6.6-7.3, 22 to 28"+	Well	Moderate	Medium	Moderate	60+	9 - 10	High	Alfalfa truck crops
YoA	2,732	1.9	Yolo loam, 0 to 2 percent slopes	I	Nearly level alluvial fans	Grayish brown, massive, hard, pH 6.1-6.5, 16 to 20"	Grayish brown loam, massive, hard, pH 6.6-7.3, 18 to 22"	Yellowish brown loam, massive, hard, pH 6.6-7.3, 18 to 26"+	Well	Moderate	Medium	None	60+	10 - 11	High	Alfalfa truck crops
YoBC	3,386	2.3	Yolo loam, 2 to 9 percent slopes	IIel	Gently to moderately sloping alluvial fans	Grayish brown, massive, hard, pH 6.1-6.5, 14 to 18"	Grayish brown loam, massive, hard, pH 6.6-7.3, 18 to 22"	Yellowish brown loam, massive, hard, pH 6.6-7.3, 20 to 28"+	Well	Moderate	Medium	Slight to Moderate	60+	10 - 11	High	Alfalfa truck crops
ZaA	37	1/	Zamora loam, 0 to 2 percent slopes	I	Nearly level terraces	Grayish brown, massive, hard, pH 6.1-6.5, 11 to 14"	Brown clay loam, blocky, hard, pH 6.6-7.3, 24 to 30"	Pale brown loam, massive, hard, pH 7.9-8.4, 16 to 25"	Well	Moderate	Medium	None	60	10 - 11	High	Alfalfa truck crops
ZaBC	612	0.4	Zamora loam, 2 to 9 percent slopes	IIel	Gently to moderately sloping terraces	Grayish brown, massive, hard, pH 6.1-6.5, 11 to 14"	Brown clay loam, blocky, hard, pH 6.6-7.3, 24 to 30"	Pale brown loam, massive, hard, pH 7.9-8.4, 16 to 25"+	Well	Moderate	Medium	Slight to Moderate	60	10 - 11	High	Alfalfa range
ZaD	100	1/	Zamora loam, 9 to 16 percent slopes	IIIel	Strongly sloping terraces	Grayish brown, massive, hard, pH 6.1-6.5, 8 to 12"	Brown clay loam, blocky, hard, pH 6.6-7.3, 24 to 30"	Pale brown loams, massive, hard, pH 7.9-8.4, 18 to 28"+	Well	Moderate	Medium to Rapid	Moderate	60	10 - 11	Moderate	Dry pasture barley
ZcA	38	1/	Zamora clay loam, 0 to 2 percent slopes	I	Nearly level terraces	Grayish brown, massive, hard, pH 6.1-6.5, 10 to 12"	Grayish brown clay loam, blocky, hard, pH 6.6-7.3, 24 to 30"	Brown loam, massive, hard, pH 6.6-7.3, 18 to 26"+	Well	Moderately Slow	Medium	None	60	10.5 - 12	Moderate	Orchards

TABLE I

SOIL CHARACTERISTICS AND QUALITIES

SAUGUS - NEWHALL AREA

Sheet 5 of 10

MAP SYMBOL	AREA (acres)	EXTENT (percent)	SOIL NAME	CAP UNIT	POSITION	SOIL PROFILE (dry)			NAT DRAIN	SUBSOIL PERM	RUNOFF	EROSION HAZARD	EFF DEPTH (in)	AWC (in)	FERTILITY	PRESENT USE
						Surface Layer	Subsoil	Substratum or Parent Material								
MhF2	7,325	5.0	Millsholm loam, 30 to 50 percent slopes, eroded	VIIe1	Steep mountainous uplands	Brown, massive, hard, pH 6.6-7.3, 3 to 6"	Brown loam, massive, hard, pH 6.6-7.3, 8 to 10"	Hard fine grained sandstone and shale at 11 to 16"	Well	Moderate	Rapid	High	11 - 16	2.0 - 3.0	Low	Range
McA	350	0.2	Mocho sandy loam, 0 to 2 percent slopes	I	Nearly level alluvial fans	Brown, massive, slightly hard, pH 7.4-7.8, 8 to 10"	Grayish brown loam, massive, hard, pH 7.9-8.4, 25 to 30", calcareous	Grayish brown loam, massive, hard, pH 7.9-8.4, 10 to 20"+, calcareous	Moderately Well	Moderate	Medium	Slight	60+	10 - 11	Moderate	Alfalfa truck crops
MoA	348	0.2	Mocho loam, 0 to 2 percent slopes	I	Nearly level alluvial fans	Grayish brown, massive, hard, pH 7.9-8.4, 10 to 12"	Grayish brown loam, massive, hard, pH 7.9-8.4, 30 to 36", calcareous	Grayish brown loam, massive, hard, pH 7.9-8.4, 20"+, calcareous	Moderately Well	Moderate	Medium	Slight	60+	10 - 11	High	Alfalfa truck crops
MoBC	579	0.4	Mocno loam, 2 to 9 percent slopes	IIe1	Gently to moderately sloping alluvial fans	Grayish brown, massive, hard, pH 7.9-8.4, 10 to 12"	Grayish brown loam, massive, hard, pH 7.9-8.4, 30 to 36", calcareous	Grayish brown loam, massive, hard, pH 7.9-8.4, 20"+ calcareous	Moderately Well	Moderate	Medium	Moderate	60+	10 - 11	High	Alfalfa truck crops
OaBC	1,285	0.9	Ojai loam, 2 to 9 percent slopes	IIIe3	Gently to moderately sloping terraces	Brown, massive, hard, pH 6.1-6.5, 10 to 14"	Reddish brown clay loam, blocky, hard, pH 6.1-6.5, 20 to 32"	Reddish yellow loam, massive, hard, pH 6.1-6.5, 14 to 30", often gravelly	Well	Slow	Medium	Moderate	60	8.0 - 9.0	Moderate	Urban range truck crops
OaD	300	0.2	Ojai loam, 9 to 16 percent slopes	IVe3	Strongly sloping foothills	Brown, massive, hard, pH 6.1-6.5, 8 to 10"	Reddish brown clay loam, blocky, hard, pH 6.1-6.5, 24 to 30"	Reddish yellow loam, massive, hard, pH 6.1-6.5, 20 to 28", some gravels	Well	Slow	Medium	Moderate	60	7.0 - 8.0	Low	Range
OaE	889	0.6	Ojai loam, 16 to 30 percent slopes	VIe3	Moderately steep foothills	Grayish brown loam, massive, hard, pH 6.1-6.5, 8 to 14"	Reddish brown clay loam, blocky, hard, pH 6.1-6.5, 24 to 36"	Reddish yellow loam, massive, hard, pH 6.1-6.5, 20 to 28" some gravels	Well	Slow	Medium	Moderate	60	7.0 - 8.0	Low	Range
OaF	5,202	3.6	Ojai loam, 30 to 50 percent slopes	VIIe1	Steep foothills	Brown, massive, hard, pH 6.1-6.5, 8 to 14"	Reddish brown sandy clay loam, blocky, hard, pH 6.1-6.5, 24 to 30"	Reddish yellow loamy sands, massive, hard, pH 6.1-6.5, 18"+, some sandstone strata	Well	Slow	Medium to Rapid	Moderate	48 - 60 variable	7.0 - 9.0	Low	Range
OaF2	560	0.4	Ojai loam, 30 to 50 percent slopes, eroded	VIIe1	Steep foothills	Brown, massive, hard, pH 6.1-6.5, 8 to 14"	Reddish brown sandy clay loam, blocky, hard, pH 6.1-6.5, 22 to 28"	Reddish yellow loamy sands, massive, hard, pH 6.1-6.5, 18"+, some sandstone strata	Well	Slow	Medium to Rapid	High	48 - 60 variable	7.0 - 9.0	Low	Range

United States Department of the Interior

FISH AND WILDLIFE SERVICE
SACRAMENTO ENDANGERED SPECIES OFFICE
1230 "N" Street, 14th Floor
Sacramento, California 95814

FEB 17 1984

In reply refer to: SESO
#1-1-84-SP-157

Mr. Carl F. Enson
Chief, Planning Division
Department of the Army
Los Angeles District
Corps of Engineers
P.O. Box 2711
Los Angeles, California 90053

Subject: Request for List of Endangered and Threatened Species in the Area of South Fork of the Santa Clara River, Los Angeles County, California

Dear Mr. Enson:

As requested by letter from your agency dated January 23, 1984, you will find attached a list of listed endangered and threatened species (Attachment A) that may be present in the area of the subject project. To the best of our knowledge no proposed species occur within the area. The list is intended to fulfill the requirement of the Fish and Wildlife Service to provide a list of species under Section 7(c) of the Endangered Species Act, as amended. Please see Attachment B for your requirements.

Also for your assistance, we have included a list of candidate species. These species are presently being reviewed by our Service for consideration to propose and list as endangered or threatened. Candidate species have no protection under the Endangered Species Act and are included for your consideration as it is possible the candidates could become formal proposals and be listed during the construction period.

Upon completion of the Biological Assessment (see Attachment B), should you determine that a listed species is likely to be affected (adversely or beneficially), then your agency should request formal Section 7 consultation through our office at the letterhead address. If there are both listed and candidate species (if included in the assessment) that may be affected and if requested, we will informally consult on the candidate species during the formal consultation. However, should the assessment reveal that only candidate species may be affected, then you should consider informal consultation with our office at the letterhead address.

One of the benefits of informal consultation to the consulting agency is to provide the necessary planning alternatives should a candidate species become listed before completion of a project. Informal consultation may also be utilized prior to a written request for formal consultation to exchange information and resolve conflicts with respect to listed species.

If the Biological Assessment is not initiated within 90 days of receipt of this letter, you should informally verify the accuracy of the list with our office.

Should you have any additional questions regarding this list or your responsibilities under the Act, please contact Mr. Ralph Swanson at (FTS) 448-2791 or (916) 440-2791. Thank you for your interest in endangered species, and we await your assessment.

Sincerely yours,

Gail C. Kobetich

Project Leader

Attachments

LISTED AND PROPOSED ENDANGERED AND THREATENED
SPECIES, AND CANDIDATE SPECIES THAT MAY OCCUR
IN THE AREA OF THE PROPOSED
SOUTH FORK OF SANTA CLARA RIVER
LOS ANGELES COUNTY, CALIFORNIA
#1-1-84-SP-157

LISTED SPECIES

Unarmored threespine stickleback, *Gasterosteus aculeatus williamsoni* (E)

PROPOSED SPECIES

None

CANDIDATE SPECIES

Plants

Slender-horned spineflower, *Centrostegia leptoceras* (1)

(1) Category 1, Plant Notice of Review, 45 FR 82480

ATTACHMENT B

FEDERAL ACTION AGENCY REQUIREMENTS UNDER SECTION 7(c)

Biological Assessments

This process is initiated by a Federal agency in requesting a list of proposed and listed endangered and threatened species that may be within the area of a construction project. 1/ The purpose of the assessment is to identify any proposed and/or listed species which are/is likely to be affected by a construction project. The assessment should be completed within 180 days after initiation of the assessment (or within such a time period as is mutually agreed to by our two agencies). If the Biological Assessment is not initiated within 90 days of receipt of the species list, your agency should informally verify the accuracy of the list with our Service. No irreversible commitment of resources is to be made during the Biological Assessment process which would result in violation of your requirements under section 7(a) of the Act. Planning, design, and administrative actions may be taken by your agency; however, no construction may begin.

Your agency should: conduct an on-site inspection of the area to be affected by the proposal which may include a detailed survey of the area to determine if the species is present and whether suitable habitat exists for either expanding the existing population or for potential reintroduction of the species; review literature and scientific data to determine species distribution, habitat needs, and other biological requirements; interview experts including those within Fish and Wildlife Service, National Marine Fisheries Service, State conservation departments, universities and others who may have data not yet published in scientific literature; review and analyze the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat; analyze alternative actions that may provide conservation measures. At the conclusion of the assessment as described above, the Federal agency shall prepare a report documenting the results. The report shall also include a discussion of study methods used, any problems encountered, and other relevent information. Upon completion, the report should be forwarded to our office (1230 "N" Street, 14th Floor, Sacramento, CA 95814).

1/ "Construction Project" means any major Federal action which significantly affects the quality of the human environment designed primarily to result in the building or erection of man-made structures such as dams, buildings, roads, pipelines, channels, and the like. This includes Federal actions such as permits, grants, licenses, or other forms of Federal authorization or approval which may result in construction.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
SACRAMENTO ENDANGERED SPECIES OFFICE
2800 Cottage Way, Room E-1823
Sacramento, California 95825

OCT 11 1984

Department of the Army
Los Angeles District
Corps of Engineers
Environmental Resources Branch
Attn: William Porter
P.O. Box 2711
Los Angeles, California 90053

Subject: Endangered and Threatened Species in the Area of South Fork of the Santa Clara River, Los Angeles, County, California (1-1-84-SP-157R)

Dear Sir:

This letter is intended to reconfirm our species list letter of 17 February 1984 for the subject project on the South Fork of the Santa Clara River. As per our 17 February letter, we believe that the endangered unarmored threespine stickleback, Gasterosteus aculeatus williamsoni, and a candidate species, the slender-horned spineflower, Centrostegia leptoceras, may be affected by the proposed project. To the best of our knowledge, neither the California condor, least Bell's vireo nor other Federally-listed, proposed or candidate species will be affected by this action. Please refer any questions regarding this list on your responsibilities under the Endangered Species Act, as amended, to Dr. Jack Williams of my staff at the above address or at 916/484-4935; FTS 468-4935.

Sincerely,

Gail C. Kobetich

Gail C. Kobetich
Project Leader

cc:
Field Supervisor, Ecological Services, Laguna Niguel, CA (ES-LN)
Regional Director, Portland, OR (AFA-SE)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
24000 Avila Road
Laguna Niguel, California 92677

June 22, 1984

Commander
Los Angeles District
Corps of Engineers
P.O. Box 2711
Los Angeles, California 90053

Re: Draft Supplement to the Final Fish and Wildlife Coordination Act Report (July 1981) on the South Fork of the Santa Clara River Flood Control Project

Dear Sir:

This letter constitutes a supplement to the U.S. Fish and Wildlife Service (FWS) July 1981 final Fish and Wildlife Coordination Act (FWCA) Report on the South Fork of the Santa Clara River Flood Control Project. The preparation of this document is in accordance with the agreement between the FWS and the Los Angeles District of the Corps of Engineers (CE) and is detailed in the Fiscal Year 1984 Scope of Work. A supplement was necessary due to the selection of a plan involving more structural features than described in the FWCA Report. The purpose of this report is to reevaluate current conditions, assess impacts, and determine appropriate mitigation. Findings herein are based on the final FWCA Report, and on three additional reconnaissance visits to the site held January 24, April 6, and May 3, 1984.

A. PLAN DESCRIPTION

1. Project Location and Purpose

The CE, at the request of the Los Angeles Flood Control District (LAFCD), is proposing to provide standard flood protection to urban areas adjacent to the South Fork of the Santa Clara River (South Fork) through the use of a debris basin and rectangular concrete-lined channel. The project is located in the northwest corner of Los Angeles County, where Interstate 5 (I-5) crosses this stream near Newhall, California.

2. Project Alternatives

The recommended project is almost identical to Plan A as described in the FWCA Report. This plan calls for a debris basin to be located at the confluence of Wiley and Towsley Canyons, and channelization of the South Fork below this basin (see Figure 1). The plan has been amended to include the straightening of Wiley Canyon Road.

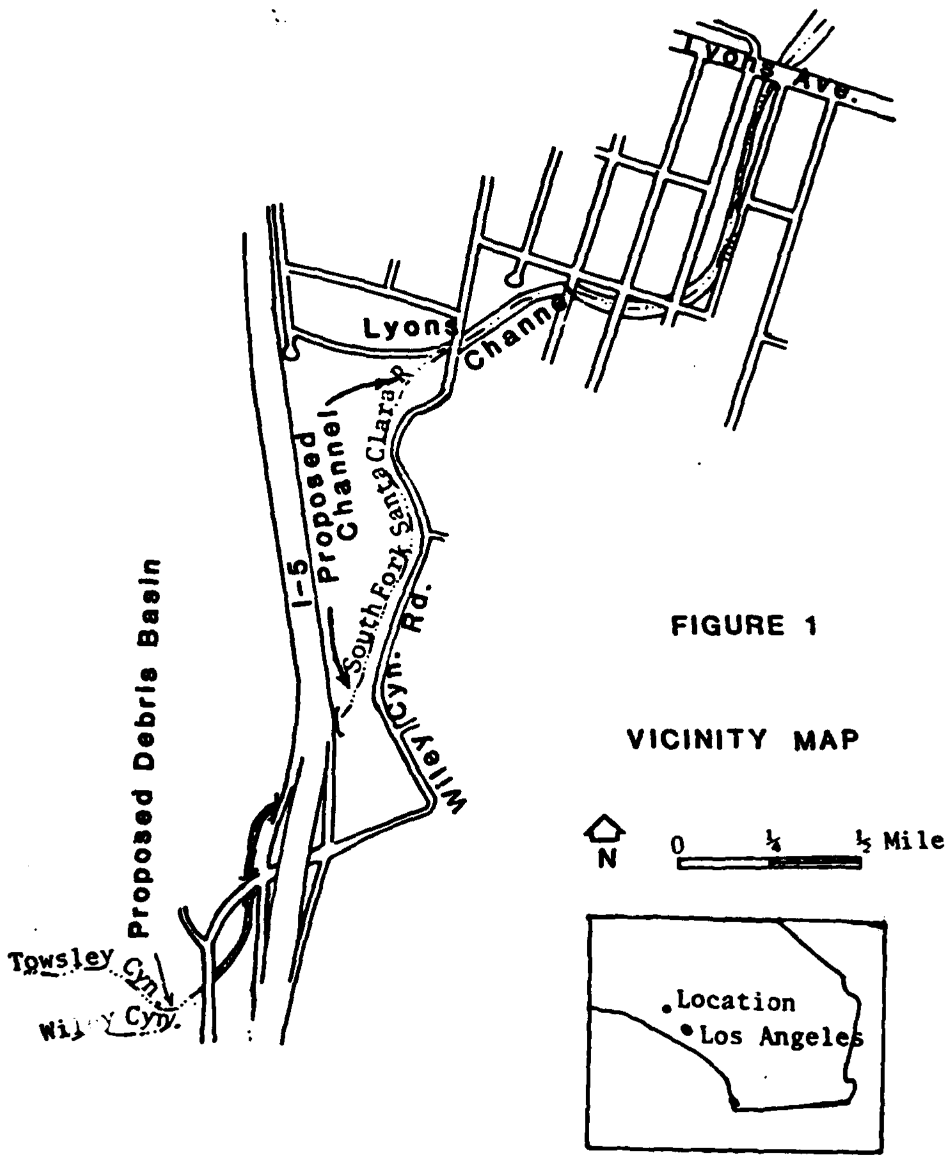

FIGURE 1

VICINITY MAP

Originally, eight other alternatives were considered in detail including Plan B which was similar to Plan A, but provided flood control protection for a 100-year event. Plan E-3, formerly selected, used limited structural features (a culvert, flood flow area, and levee) to provide flood protection. This plan was abandoned due to a lack of local support. Plan G proposed a combination of floodwalls to provide protection from a 100-year event, floodplain building restrictions, flood insurance, and an early warning system.

B. BIOLOGICAL EVALUATIONS

1. Existing Conditions

The existing conditions were adequately described in the final FWCA report; however, they will be summarized here in light of more recent field reconnaissance. Table 1 lists species detected in 1984 that were not mentioned in the July 1981 FWCA Report.

a. Aquatic Resources - The South Fork of the Santa Clara River is an intermittent stream in the project area. Surface flows may remain continuous in some years. No fish have been observed in the area. The western toad (Bufo borias) was heard in Towsley Canyon.

The stream supports riparian vegetation. Trees observed include arroyo willows (Salix lasiolepis), cottonwoods (Populus fremontii), and California sycamore (Platanus racemosa). There are large patches of mulefat (Baccharis glutinosa) and small patches of cattails (Typha sp.). From the mouths of Wiley and Towsley Canyons to I-5 there are a few arroyo willows. In this reach there are small patches of cattails. The riparian vegetation is discontinuous at I-5 where an existing concrete channel carries the stream under the freeway. From I-5 to Lyons Avenue there are more willows and some cottonwoods. Also in this area there is a side channel (probably the original channel), which lacks flowing water, but is still moist enough to support riparian vegetation. At the southernmost portion of this side channel, seepage or urban runoff is sufficient to support cattails. The width of vegetation varies between approximately 15 and 30 meters; the depth of the incised channel varies between about two and five meters. Below Lyons Avenue the habitat is impoverished because of previous earthen channelization.

Bird species observed in the riparian habitat of the project area include Song Sparrow (Melospiza melodia), Lincoln's Sparrow (M. lincolnii), Black Phoebe (Sayornis nigricans), Say's Phoebe (S. saya), Brown Towhee (Papilo fuscus), Ruby-crowned Kinglet (Regalus calendula), Yellow-rumped Warbler (Dendroica coronata), Lesser Goldfinch (Carduelis psaltria), Common Snipe (Gallinago gallinago), and Bushtit (Psaltriparus minimus). Mammals detected in this area include mule deer (Odocoileus hemionus), cottontail (Sylvilagus auduboni), and California ground squirrel (Citellus beecheyi).

b. Terrestrial Resources - Terrestrial habitats found in the project area include old field, California walnut woodland, and associated shrublands. Adjacent to most of the riparian zone and the concrete channel is coastal sage scrub habitat. This plant community is dominated by shrubs such as California sage (Artemisia californica), great basin sage (A. tridentata), black sage (Salvia melifera), and California buckwheat (Eriogonum fasciculatum).

Table 1. Species detected in 1984, not reported in the FWCA Report (FWS 1981)

PLANTS

Grasses	
Soft chess	_Bromus molis_
Rice grass	_Oryzopsis miliacea_
Shrub and forbs	
APIACEAE	
Snakeroot	_Sanicula crassicaulis_
ASTERACEAE	
Sand-bur	_Ambrosia acanthocarpa_
	Corethrogyne filaginiforia
Everlasting	_Gnaphalium californicum_
Goldenbush	_Haplopappus ericoides_
	Haplopappus palmeri
	Perezia microcephala
Groundsil	_Senecio douglasii_
BORAGINACEAE	
	Amsinkia menziesii
BRASSICACEAE	
Mustard	_Brassica geniculata_
FABACEAE	
Lupine	_Lupinus albifrons_
	Lupinus excubitus
HYDROPHYLLACEAE	
Yerba Santa	_Eriodictyon trichocalyx_
Eucrypta	_Eucrypta chrysanthemifolia_
LAMIACEAE	
Purple Sage	_Salvia leucophylla_
PAEONIACEAE	
Peony	_Paeonia californica_
SCROPHULARIACEAE	
Monkey Flower	_Mimulus longiflorus_
RHAMNACEAE	
Deer Brush	_Ceanothus integerrimus_
	Ceanothus oliganthus
VERBENACEAE	
Verbena	_Verbena lasiostyachys_

Table 1 (cont.)

BIRDS

Common Name	Scientific Name
Red-shouldered Hawk	Buteo lineatus
Common Snipe	Gallinago gallinago
Spotted Dove	Streptopelia chinensis
White-throated Swift	Aeronautes saxatalis
Belted Kingfisher	Ceryle alcyon
Say's Phoebe	Sayornis say
Plain Titmouse	Parus inornatus
Bewick's Wren	Thryomanes bewickii
Ruby-crowned Kinglet	Regalus calendula
California Thrasher	Toxostoma redivivum
Phainopepla	Phainopepla nitens
Loggerhead shrike	Lanius ludovicianus
Hutton's Vireo	Vireo huttoni
Orange-crowned Warbler	Vermivora celata
Yellow-rumped Warbler	Dendroica coronata
Western Tanager	Piranga ludoviciana
Rufous-sided Towhee	Pipilo erythrophthalmus
Lark Sparrow	Chondestes grammacus
White-crowned Sparrow	Zonotrichia leucophrys
Dark-eyed Junco	Junco hyemalis
Lincoln's Sparrow	Melospiza lincolnii
Song Sparrow	Melospiza melodia
Western Meadowlark	Sturnella neglecta
Lesser Goldfinch	Carduelis psaltria

The California walnut woodland occurs primarily on the north-facing slopes of Towsley Canyon and in the steeper side canyons (such as Wiley) of the project area. The vegetation of these hillsides and canyons is patchy as coastal sage scrub and soft chaparral habitats are intermixed. The woodland habitat is dominated by California walnut (Juglans californica); there are a few coast live oaks (Quercus agrifolia) present. In some areas this coastal sage scrub (or soft chaparral) forms an understory beneath the walnut trees. The coastal sage scrub of the canyons consists of species such as deer brush (Ceanothus integerrimus), golden bush (Haplopappus palmeri and H. ericoides), purple sage (Salvia leucophylla), and deerweed (Lotus scoparius).

Avian species seen in the woodland habitat include Red-shouldered Hawk (Buteo lineatus), Common Raven (Corvus corax), Northern Flicker (Calaptes auratus), Wrentit (Chamaea fasciata), Phainopepla (Phainopepla nitens), Plain Titmouse (Parus inornatus), and Scrub Jay (Aphelocoma coerulescens). Some of the mammals detected in these habitats included mule deer, coyote (Canis latrans), dusky-footed woodrat (Neotoma fuscipes), and California ground squirrel.

The woodland habitat provides excellent habitat for wildlife in the project area, particularly hole nesting species such as plain titmice and Northern Flickers. Furthermore, both walnuts and oaks provide great amounts of food reserves for many bird and mammal species. Mature walnut woodlands, such as those of the project area, are becoming scarce in southern California due to urban developments.

Old field habitat occurs on the east side of I-5. The area is highly disturbed, dominated by weedy exotics such as mustard (Brassica geniculata), telegraph weed (Heterotheca grandiflora), brome grass (Bromus molis), and Russian thistle (Salsola iberica). Secondary succession appears to be proceeding in this area as there are some coastal sage elements within this old field; these include California buckwheat and elderberry (Sambucus mexicana). Parts of the floor of Towsley Canyon are in this same disturbed condition. Mammals observed in the old field area include gophers (Thomomys bottae) and cottontail. Birds seen in this area were Western Meadowlarks (Sturnell magna), Water Pipits (Anthus spinoletta), and Spotted Doves (Streptopelia chinensis).

Throughout the project area there are signs of overgrazing; these include domination of the herbaceous layer by brome grasses and the presence of numerous gopher burrows.

c. Sensitive Species - The project area is within the range of the unarmored threespine stickleback (Gasterosteus aculeats williamsoni), a species listed as endangered. The South Fork is an intermittent stream in this reach, and no fish have been observed in the project area.

The project area is also within the range of a Federal candidate species, the slender-horned spineflower (Centrostegia leptoceras). A search conducted by the CE in the spring of 1984 failed to locate any individuals.

2. Future Without Project

Without the project, the stream and riparian habitat would remain in about the same condition that they are in now. Secondary succession within the old field would continue.

3. Future With Project

Impacts would probably be similar to those described for Plan A in the final FWCA Report.

About two acres of riparian habitat would be eliminated due to channelization below the debris basin and the straightening of Wiley Canyon Road. The riparian area within the debris basin would be of lower quality than that now present due to post storm removal activities.

About 4.5 acres of walnut woodland and associated coastal sage scrub or chaparral would be removed during construction or during subsequent inundation behind the debris dam. Neither mature oaks (Heritage Oaks Committee 1980) nor walnuts can tolerate an increased water regime. Oaks are very long lived, and decades may be required to replace those removed by this project. Furthermore, some oak populations are not regenerating themselves because the seedlings do not reach maturity. Suggested causes include herbivory (by gophers, deer, and rabbits) and fluctuating water tables. Nearby populations of coast live oaks in Newhall have been shown to have a skewed age ratio towards older individuals (Price and Assoc. 1973). The oak and walnut groves of the project area were found to have this skewed age ratio as well. Consequently, oaks and walnuts that are removed by this project will probably not be replaced.

Coastal sage scrub will be eliminated due to channelization, hillside reconfiguration, inundation behind the debris basin, and straightening of Wiley Canyon Road.

In summary, two acres of riparian and about five acres of walnut woodlands and associated shrublands would be removed or degraded by the construction of this project.

Pursuant to the FWS mitigation policy, all habitat types within the project area have been assigned Resource Categories based on their value to wildlife species. Riparian habitat in the project area, due to its inherent diversity and increasing scarcity, constitutes a Category 2 Resource. Both walnut and oak woodlands, because of the food reserves they provide to area species, constitute Category 3 Resources. Because of the food reserves it provides, coastal sage scrub is also a Category 3 Resource. The old field constitutes a Category 4 Resource. Resource Categories 2 and 3 are of relatively high value, whereas Category 4 is of relatively low value. Resource Category 2 sites require "in-kind" mitigation, whereas Category 3 calls for a maintenance of existing values, minimizing "in-kind" habitat loss.

C. RECOMMENDATIONS

The following recommendations are based on current on-site conditions and a reevaluation of the project. These measures reflect the FWS mitigation policy and would minimize impacts to biological resources. Following consensus by all parties (the CE, LAFCD, California Department of Fish and Game (CDFG) and FWS), these conditions (or similar measures) should be included in the project design.

1. To offset the loss of two acres of riparian habitat, ten acres of disturbed habitat (of low wildlife value) should be acquired and developed to "create" riparian habitat. A suitable area occurs on the floor of Towsley Canyon, above the excavation line of the debris basin. Part of this replacement area may therefore be within the standard project flood debris line. A greater replacement area than the 2-acre loss is needed partially to offset reduced habitat availability during restoration efforts, to allow for some risk should some of the plantings not be successful, and to account for the extant values of the replacement area.

a. Riparian plantings should include tree species such as willows, California sycamore, California walnuts and cottonwoods, and shrubs such as mulefat and elderberry. The goal of these plantings should be to provide habitat that has tree densities of about 90 per $100m^2$ (yielding about 60% cover) and shrub densities of 120 per $100m^2$ (yielding about 70% cover).

b. To provide interim nest holes for cavity nesters, prior to the removal of any existing vegetation, 20 nest boxes should be attached to trees within the project area or immediate vicinity.

c. A portion of the riparian area should be reconfigured to form two 3-acre ponds. These ponds should be of a convoluted shape to provide more edge habitat. Freshwater marsh vegetation, such as sedges (*Carex* sp.) and bulrushes (*Juncus*), should be encouraged to grow around pond edges. This measure may extend the water availability to wildlife in years when the intermittent stream may otherwise be dry.

2. The loss of 4.5 acres of walnut woodland that would be removed by the project may be offset using one of two options:

a. Approximately ten acres of similar habitat may be purchased and donated to a government agency or private organization whose main concern is habitat preservation, or otherwise preserved in perpetuity. Suitable agencies and organizations include the CDFG, FWS, and the Nature Conservancy. This area must be under the threat of development over the next 20 years and must be of similar quality to that now present; or,

b. Five acres suitable for planting walnuts should be provided, and nursery-grown California walnuts and coast live oaks should be planted. These trees should be no smaller than the 5-gallon size. The planting of oaks should follow the guidelines of the Heritage Oaks Committee (1980). Shrub species native to the project area should be incorporated into the design. Suggested species include black sage, purple sage, California rose (*Rosa californica*),

deer brush, and California buckwheat. Again, suitable land may be present in Towsley Canyon. This site may be adjacent to that discussed in sections 1.a. through c.

3. Planted areas discussed in sections 1.a. through c. and 2.b. should be regarded as experimental in nature and should be monitored (for at least five years) with respect to wildlife usage (reconnaissance level), and success of planting procedures. The CE or LAFCD should provide the funding for this monitoring effort. Should these plantings fail to result in the desired coverage discussed in section 1b, then additional plantings should be provided.

4. Planted areas discussed in sections 1.a. through c. and 2.b. should be designed by a landscape architect experienced with the habitat requirements of native vegetation similar to that of the project area. Suggested species require different water regimes; the plan will have to accommodate these differences. The specific design should be agreed to by the CE, LAFDC, FWS, and CDFG.

5. Contractors hired to accomplish the mitigation goals of this project should be experienced in working with native vegetation similar to that of the project area.

6. All land uses within mitigation areas should be compatible with wildlife usage. The CE and LAFCD should coordinate with the FWS and CDFG in establishing land use policies within these areas.

7. Plant species native to the project area should be used adjacent to channels for aesthetic treatments, wherever possible. The area around the debris basin should also be provided with plantings of species native to the project area.

8. All construction and post storm removal activities should avoid native habitats, wherever possible. The CE and LAFCD should coordinate with the FWS and CDFG prior to all maintenance activities.

Please call Karla Kramer or me at FTS 796-4270 or (714) 831-4270 if you have any questions regarding this report.

Sincerely yours,

for Nancy Kaufman
Field Supervisor

cc: CDFG, Reg. 5, Long Beach, CA
CDFG, Sacramento, CA

References

Heritage Oaks Committee. 1980. Native oaks, our valley heritage. Sacramento County Office of Education. 60 pp.

Price, J.L. and Associates. 1973. Preliminary ecological monograph on the coast live oak (*Quercus agrifolia*). Submitted to U.S. Army Corps of Engineers, Los Angeles District. 47 pp.

USDI, U.S. Fish and Wildlife Service. 1981. Final fish and wildlife coordination act report. South fork of the Santa Clara River flood control project. Ecological Services, Laguna Niguel. 42 pp.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
24000 Avila Road
Laguna Niguel, California 92677

October 10, 1984

Colonel Dennis F. Butler
District Engineer
Los Angeles District, Corps of Engineers
P.O. Box 2711
Los Angeles, California 90053

Re: Supplement to the Final Fish and Wildlife Coordination Act Report (July 1981) on the South Fork of the Santa Clara River Flood Control Project

Dear Colonel Butler:

This letter constitutes a supplement to the U.S. Fish and Wildlife Service (FWS) July 1981 final Fish and Wildlife Coordination Act (FWCA) Report on the South Fork of the Santa Clara River Flood Control Project. The preparation of this document is in accordance with the agreement between the FWS and the Los Angeles District of the Corps of Engineers (CE) and is detailed in the Fiscal Year 1984 Scope of Work. A supplement was necessary due to the selection of a plan involving more structural features than described in the FWCA Report. The purpose of this report is to reevaluate current conditions, assess impacts, and determine appropriate mitigation. Findings herein are based on the final FWCA Report, and on three additional reconnaissance visits to the site held January 24, April 6, and May 3, 1984. A letter discussing California Department of Fish and Game (CDFG) concurrence with this report is enclosed.

A. PLAN DESCRIPTION

1. Project Location and Purpose

The CE, at the request of the Los Angeles County Flood Control District (LACFCD), is proposing to provide standard flood protection to urban areas adjacent to the South Fork of the Santa Clara River (South Fork) through the use of a debris basin and rectangular concrete-lined channel. The project is located in the northwest corner of Los Angeles County, where Interstate 5 (I-5) crosses this stream near Newhall, California.

2. Project Alternatives

The recommended project is almost identical to Plan A as described in the FWCA Report. This plan calls for a debris basin to be located at the confluence of Wiley and Towsley Canyons, and channelization of the South Fork below this basin (see Figure 1). The plan has been amended to include the straightening of Wiley Canyon Road.

Originally, eight other alternatives were considered in detail including Plan B which was similar to Plan A, but provided flood control protection for a 100-year event. Plan E-3, formerly selected, used limited structural features (a culvert, flood flow area, and levee) to provide flood protection. This plan was abandoned due to a lack of local support. Plan G proposed a combination of floodwalls to provide protection from a 100-year event, floodplain building restrictions, flood insurance, and an early warning system.

B. BIOLOGICAL EVALUATIONS

1. Existing Conditions

The existing conditions were adequately described in the final FWCA report; however, they will be summarized here in light of more recent field reconnaissance. Table 1 lists species detected in 1984 that were not mentioned in the July 1981 FWCA Report.

a. Aquatic Resources - The South Fork of the Santa Clara River is an intermittent stream in the project area. Surface flows may remain continuous in some years. No fish have been observed in the area. The western toad (*Bufo borias*) was heard in Towsley Canyon.

The stream supports riparian vegetation. Trees observed include arroyo willows (*Salix lasiolepis*), cottonwoods (*Populus fremontii*), and California sycamore (*Platanus racemosa*). There are large patches of mulefat (*Baccharis glutinosa*) and small patches of cat-tails (*Typha* sp.). From the mouths of Wiley and Towsley Canyons to I-5 there are a few arroyo willows. In this reach there are small patches of cat-tails. The riparian vegetation is discontinuous at I-5 where an existing concrete channel carries the stream under the freeway. From I-5 to Lyons Avenue there are more willows and some cottonwoods. Also in this area there is a side channel (probably the original channel), which lacks flowing water, but is still moist enough to support riparian vegetation. At the southernmost portion of this side channel, seepage or urban runoff is sufficient to support cat-tails. The width of vegetation varies between approximately 15 and 30 meters; the depth of the incised channel varies between about two and five meters. Below Lyons Avenue the habitat is impoverished because of previous earthen channelization.

Bird species observed in the riparian habitat of the project area include Song Sparrow (*Melospiza melodia*), Lincoln's Sparrow (*M. lincolnii*), Black Phoebe (*Sayornis nigricans*), Say's Phoebe (*S. saya*), Brown Towhee (*Papilo fuscus*), Ruby-crowned Kinglet (*Regalus calendula*), Yellow-rumped Warbler (*Dendroica coronata*), Lesser Goldfinch (*Carduelis psaltria*), Common Snipe (*Gallinago gallinago*), and Bushtit (*Psaltriparus minimus*). Mammals detected in this area include mule deer (*Odocoileus hemionus*), cottontail (*Sylvilagus auduboni*), and California ground squirrel (*Citellus beecheyi*).

b. Terrestrial Resources - Terrestrial habitats found in the project area include old field, California walnut woodland, and associated shrublands. Adjacent to most of the riparian zone and the concrete channel is coastal sage scrub habitat. This plant community is dominated by shrubs such as California sage (*Artemisia californica*), great basin sage (*A. tridentata*), black sage (*Salvia melifera*), and California buckwheat (*Eriogonum fasciculatum*).

Table 1. Species detected in 1984, not reported in the FWCA Report (FWS 1981)

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Rice grass	*Oryzopsis miliacea*
<u>Shrub and forbs</u>	
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Sand-bur	*Ambrosia acanthocarpa*
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Everlasting	*Gnaphalium californicum*
Mock Heather	*Haplopappus ericoides*
Palmer's Ericameria	*Haplopappus palmeri*
Sacapellote	*Perezia microcephala*
Groundsil	*Senecio douglasii*
BORAGINACEAE	
Rigid Fiddle-neck	*Amsinckia menziesii*
BRASSICACEAE	
Mustard	*Brassica geniculata*
FABACEAE	
Silver Lupine	*Lupinus albifrons*
Interior Bush Lupine	*Lupinus excubitus*
HYDROPHYLLACEAE	
Yerba Santa	*Eriodictyon trichocalyx*
Eucrypta	*Eucrypta chrysanthemifolia*
LAMIACEAE	
Purple Sage	*Salvia leucophylla*
PAEONIACEAE	
Peony	*Paeonia californica*
RHAMNACEAE	
Hairy Deer-brush	*Ceanothus integerrimus*
Deer-brush	*Ceanothus oliganthus*
SCROPHULARIACEAE	
Monkey Flower	*Mimulus longiflorus*
VERBENACEAE	
Verbena	*Verbena lasiostyachys*

Table 1 (cont.)

BIRDS

Common Name	Scientific Name
Red-shouldered Hawk	Buteo lineatus
Common Snipe	Gallinago gallinago
Spotted Dove	Streptopelia chinensis
White-throated Swift	Aeronautes saxatalis
Belted Kingfisher	Ceryle alcyon
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Rufous-sided Towhee	Pipilo erythrophthalmus
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Dark-eyed Junco	Junco hyemalis
Lincoln's Sparrow	Melospiza lincolnii
Song Sparrow	Melospiza melodia
Western Meadowlark	Sturnella neglecta
Lesser Goldfinch	Carduelis psaltria

The California walnut woodland occurs primarily on the north-facing slopes of Towsley Canyon and in the steeper side canyons (such as Wiley) of the project area. The vegetation of these hillsides and canyons is patchy as coastal sage scrub and soft chaparral habitats are intermixed. The woodland habitat is dominated by California walnut (Juglans californica); there are a few coast live oaks (Quercus agrifolia) present. In some areas this coastal sage scrub (or soft chaparral) forms an understory beneath the walnut trees. The coastal sage scrub of the canyons consists of species such as deer brush (Ceanothus integerrimus), golden bush (Haplopappus palmeri and H. ericoides), purple sage (Salvia leucophylla), and deerweed (Lotus scoparius).

Avian species seen in the woodland habitat include Red-shouldered Hawk (Buteo lineatus), Common Raven (Corvus corax), Northern Flicker (Calaptes auratus), Wrentit (Chamaea fasciata), Phainopepla (Phainopepla nitens), Plain Titmouse (Parus inornatus), and Scrub Jay (Aphelocoma coerulescens). Some of the mammals detected in these habitats included mule deer, coyote (Canis latrans), dusky-footed woodrat (Neotoma fuscipes), and California ground squirrel.

The woodland habitat provides excellent habitat for wildlife in the project area, particularly hole nesting species such as plain titmice and Northern Flickers. Furthermore, both walnuts and oaks provide great amounts of food reserves for many bird and mammal species. Mature walnut woodlands, such as those of the project area, are becoming scarce in southern California due to urban developments.

Old field habitat occurs on the east side of I-5. The area is highly disturbed, dominated by weedy exotics such as mustard (Brassica geniculata), telegraph weed (Heterotheca grandiflora), brome grass (Bromus molis), and Russian thistle (Salsola iberica). Secondary succession appears to be proceeding in this area as there are some coastal sage elements within this old field; these include California buckwheat and elderberry (Sambucus mexicana). Parts of the floor of Towsley Canyon are in this same disturbed condition. Mammals observed in the old field area include gophers (Thomomys bottae) and cottontail. Birds seen in this area were Western Meadowlarks (Sturnella magna), Water Pipits (Anthus spinoletta), and Spotted Doves (Streptopelia chinensis).

Throughout the project area there are signs of overgrazing; these include domination of the herbaceous layer by brome grasses and the presence of numerous gopher burrows.

c. Sensitive Species - The project area is within the range of the unarmored threespine stickleback (Gasterosteus aculeatus williamsoni), a species federally listed as Endangered. The South Fork is an intermittent stream in this reach, and no fish have been observed in the project area.

The project area is also within the range of a Federal Category 2 candidate species, the slender-horned spineflower (Centrostegia leptoceras). A search conducted by the CE in the spring of 1984 failed to locate any individuals.

2. Future Without Project

Without the project, the stream and riparian habitat would remain in about the same condition that they are in now. Secondary succession within the old field would continue.

3. Future With Project

Impacts would probably be similar to those described for Plan A in the final FWCA Report.

About two acres of riparian habitat would be eliminated due to channelization below the debris basin and the straightening of Wiley Canyon Road. The riparian area within the debris basin would be of lower quality than that now present due to post storm removal activities.

About 4.5 acres of walnut woodland and associated coastal sage scrub or chaparral would be removed during construction or during subsequent inundation behind the debris dam. Neither mature oaks (Heritage Oaks Committee 1980) nor walnuts can tolerate an increased water regime. Oaks are very long lived, and decades may be required to replace those removed by this project. Furthermore, some oak populations are not regenerating themselves because the seedlings do not reach maturity. Suggested causes include herbivory (by gophers, deer, and rabbits) and fluctuating water tables. Nearby populations of coast live oaks in Newhall have been shown to have a skewed age ratio towards older individuals (Price and Assoc. 1973). The oak and walnut groves of the project area were found to have this skewed age ratio as well. Consequently, oaks and walnuts that are removed by this project will probably not be replaced naturally.

Approximately 1.8 acres of old field habitat would be eliminated due to channelization.

In summary, two acres of riparian and about 4.5 acres of walnut woodlands and associated shrublands will be removed or degraded by the construction of this project.

Pursuant to the FWS mitigation policy, all habitat types within the project area have been assigned Resource Categories based on their value to wildlife species. Riparian habitat in the project area, due to its inherent diversity and increasing scarcity, constitutes a Category 2 Resource. Both walnut and oak woodlands, because of the food reserves they provide to area species, constitute Category 3 Resources. Because of the food reserves it provides, coastal sage scrub is also a Category 3 Resource. The old field constitutes a Category 4 Resource. Resource Categories 2 and 3 are of relatively high value, whereas Category 4 is of relatively low value. Resource Category 2 sites require "in-kind" mitigation, whereas Category 3 calls for a maintenance of existing values, minimizing "in-kind" habitat loss.

C. RECOMMENDATIONS

The following recommendations are based on current on-site conditions and a reevaluation of the project. These measures reflect the FWS mitigation policy and would minimize impacts to biological resources. Following consensus by all

parties (the CE, LACFCD, CDFG, and FWS), these conditions shall be included in the project design.

1. To offset the loss of two acres of riparian habitat and 4.5 acres of walnut woodland and associated shrublands, the 14.5 right-of-way above the excavation line of the debris basin shall be set aside for wildlife. Of this area, approximately 9.0 acres of disturbed area in Towsley Canyon shall be used to reconstruct habitats lost due to the project. This reconstruction coupled with existing habitats in Towsley Canyon shall result in 8.3 acres of riparian habitat, 3.5 acres of coastal sage scrub, and 2.7 acres of walnut and oak woodland. A greater replacement area than the actual area lost is needed to offset reduced habitat availability during restoration efforts, to allow for some risk with respect to planting success, and to account for the extant wildlife values of the replacement area. The 9.0 acres to be revegetated shall be prepared and utilized as follows:

a) The northern bank of the deeply incised channel of Towsley Canyon shall be reconfigured to form a more gradual bank. This situation would be more likely to support riparian vegetation than the current configuration.

b) A planting scheme based on moisture contours from the stream shall be designed for riparian trees and shrubs. Approximately 2.6 acres shall be provided with fairly dense plantings of trees and shrubs. In this area the resulting tree density shall vary between 300 and 500 trees per acre. Suggested trees include willows, California sycamore, and cottonwood. Suggested species which may be used in the understory include mulefat, California blackberry (*Rubus ursinus*), and California grape (*Vitis girdiana*). Approximately 3.5 acres parallel to the stream channel and adjacent to the 2.6 acres discussed above, shall be provided with somewhat less dense plantings. In this area, the resulting tree density shall not be less than 30 trees per acre. Suggested tree species for this area include California sycamore, Fremont cottonwood, coast live oak, and California walnut. Understory species should consist of mulefat, black sage, purple sage, elderberry, as well as other shrubs of the project area. The resulting shrub density shall not be less than 300 shrubs per acre. Methods may include plantings of rooted stock or cuttings of shrubs and trees and hydroseeding of shrubs.

c) Approximately 2.4 acres shall be revegetated using California walnuts and coast live oaks. The planting of oaks shall follow the guidelines of the Heritage Oaks Committee (1980). The resulting tree density shall not be less than 30 trees per acre. Suggested shrub species for this area include deer-brush (*Ceanothus integerrimus*), deerweed, California buckwheat and yerba santa. The resulting shrub density shall not be less than 200 shrubs per acre.

d) Approximately 0.5 acres shall be planted using coastal sage scrub species native to the project area. Suggested species include purple sage, great basin sage, California buckwheat and golden bush. The resulting shrub density shall not be less than 1000 shrubs per acre. Trees such as walnuts and oaks shall be included in the design for this area. The northern hillside shall be hydroseeded with a mix of coastal sage scrub species, acceptable to the FWS and CDFG to increase the vegetative cover thereby increasing the value to wildlife.

e) To provide interim nest holes for cavity nesters, prior to the removal of any existing vegetation, 20 nest boxes shall be attached to trees within the project area.

2. Planted areas discussed in recommendations 1.a. through 1.d. shall be regarded as experimental and shall be monitored by a qualified biologist for at least two years with respect to planting success and wildlife usage (reconnaissance level). The CE or LACFCD shall provide the funding for this monitoring effort. Should plantings fail to result in desired densities, then additional plantings shall be provided. The CE and LACFCD shall not be required to replace plants removed by flood events.

3. Contractors hired to accomplish the mitigation goals of this project shall be experienced in working with native vegetation similar to that of the project area.

4. All land uses within mitigation areas shall be compatible with wildlife usage. The CE and LACFCD shall coordinate with the FWS and CDFG in establishing land use policies within these areas.

5. Plant species native to the project area should be used adjacent to channels for aesthetic treatments, wherever possible. The area around the debris basin should also be provided with plantings of species native to the project area.

6. All construction and post storm removal activities shall avoid native habitats, wherever possible. The CE and LACFCD shall coordinate with the FWS and CDFG prior to all maintenance activities. Damage to native habitats shall be repaired using methods similar to those described in recommendation numbers 1.a through 1.d.

Please call Karla Kramer or me at FTS 796-4270 or (714) 831-4270 if you have any questions regarding this report.

Sincerely yours,

Nancy Kaufman

Nancy M. Kaufman
Field Supervisor

Enclosure

cc: CDFG, Region 5, Long Beach, CA
CDFG, Sacramento, CA

References

Heritage Oaks Committee. 1980. Native oaks, our valley heritage. Sacramento County Office of Education. 60 pp.

Price, J.L. and Associates. 1973. Preliminary ecological monograph on the coast live oak (Quercus agrifolia). Submitted to U.S. Army Corps of Engineers, Los Angeles District. 47 pp.

USDI, U.S. Fish and Wildlife Service. 1981. Final fish and wildlife coordination act report. South fork of the Santa Clara River flood control project. Ecological Services, Laguna Niguel. 42 pp.

STATE OF CALIFORNIA—THE RESOURCES AGENCY GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF FISH AND GAME
1416 NINTH STREET
SACRAMENTO, CALIFORNIA 95814
(916) 445-3531

September 27, 1984

Nancy M. Kaufman, Field Supervisor
U.S. Fish and Wildlife Service
Ecological Services
24000 Avila Road
Laguna Niguel, CA 92677

Dear Ms. Kaufman:

The Department of Fish and Game concurs with the draft Fish and Wildlife Coordination Act Report prepared by your agency for the proposed small flood control project in the South Fork of the Santa Clara River. We agree that all recommendations, including the recent modification of the project, are sufficient to mitigate the potential project impacts to fish and wildlife.

Thank you for the opportunity to review and comment on this report. If you have any questions, please contact Fred A. Worthley Jr., Regional Manager of Region 5, at 245 W. Broadway, Suite 350, Long Beach, CA 90802 or by telephone at (213) 590-5113.

Sincerely,

Pete Bontadelli
for Jack C. Parnell
Director

SPLED-EP

MEMORANDUM FOR RECORD October 7, 1980

SUBJECT: Survey South Fork Santa Clara River for Existence of Vireo bellii pusillus (California least Bell's vireo).

1. Vireo bellii pusillus (California least Bell's vireo) is a Candidate species on the Federal Endangered and Threatened Species List. On 21 October 1980, Karen Helbrecht (geographer) and Sanford Wilbur, staff biologist with the U.S. Fish and Wildlife Service Endangered Species Office, surveyed the South Fork Santa Clara River project area for the existence of the Bell's vireo. Mr. Wilbur has worked on the California Fish and Game least Bell's vireo study. Most of the habitat in the project area was found to be unsuitable for the least Bell's vireo, although a section immediately downstream of the I-5 crossing seemed to have the potential for supporting 1 or 2 pairs of the Bell's vireo. No birds or nests were observed, but this sub-species winters in Mexico and does not arrive to build its nest until late March or early April. May and June are the best months to locate the Bell's vireo if it is nesting in the area, and it is recommended that further studies be conducted in the spring obtain more conclusive data.

2. Dense riparian thickets provide the most suitable habitat for Vireo bellii pusillus. In the past, the least Bell's vireo inhabited willow thickets along streams throughout California's interior valleys and southern coastal region, but the population has been declining since 1944 (Grinnell and Miller 1944). Bell's vireo have been observed nesting at Van Norman Reservior (7 miles southeast of the project area), and along the Santa Clara River east of Piru (abou. 18 miles northeast of the proposed project).

3. We walked through the entire area looking for suitable habitat and remains of Bell's vireo nests or eggshells, but nothing was found. Dense willow thickets line the South Fork of the Santa Clara River from the I-5 undercrossing to a point about 1000 feet downstream (1/2 acre), and this was determined to be possible suitable habitat for the least Bell's vireo. The vegetation begins to thin out here and it becomes marginal habitat for the Bell's vireo. According to Sanford Wilbur, there is probably enough suitable habitat in the area to support 1 or 2 pairs of Vireo bellii pusillus. We did not observe any Bell's vireo: and Mr. Lloyd F. Kiff, Curator of the Western Foundation of Vertebrate Zoology, has done field surveys in the area and has not seen any Bell's vireo. However, these surveys were not conducted during the spring, which is when the least Bell's vireo would be nesting and most active.

4. It was determined that there were no other areas of suitable habitat within the project area.

KAREN HELBRECHT
Geographer
ERB Planning Section

SPLPD-RP 19 June 1984

MEMORANDUM FOR RECORD

SUBJECT: Survey South Fork Santa Clara River Project Area for Existence of Centrostegia leptoceras, Hemizonia minthornii and Vireo bellii pusillus or Suitable Habitat

1. On 23 May 1984 Lois Goodman (Botanist) and William Porter (Ecologist) went to the South Fork of the Santa Clara River to survey the project area for the existence of Centrostegia leptoceras, Hemizonia minthornii, and Vireo bellii pusillus. The survey area consisted of both the Towsley and Wiley Canyon drainages extending approximately 400 yds upstream from the proposed debris basin thru the downstream area to the Wiley Canyon Road Bridge.

2. Centrostegia leptoceras[1]. (Slender horned spine flower) is proposed for listing on the Federal Endangered and Threatened Species List. Centrostegia is an annual plant that blooms from April to June, and may not persist long after setting seed. The species is found in occasional sandy places in Coastal Sage Scrub from the San Fernando Valley to the San Bernardino Valley. It has been collected in Pacoima Canyon Wash and Santa Anita Wash; and there is an historical collection site approximately one mile from the proposed construction site.[2]

3. Hemizonia minthornii[3] (Santa Susana Tarweed) is currently on the State of California list as a rare species. This annual is historically found growing on rocky sandstone outcrops in a chaparral habitat, seven miles south of the project area at Santa Susana Pass. Hemizonia blooms from July to October and being a woody species would persist for many weeks making detection within the project area easier.

4. Vireo bellii pusillus[4] (California least Bell's vireo) is a candidate species on the Federal Endangered and Threatened Species List. Dense riparian thickets provide the most suitable habitat for least Bell's vireo. In the past, the least Bell's vireo inhabited willow thickets along streams throughout California's interior valleys and southern coastal region, but the population has been declining since 1944 (Grinnell and Miller 1944) due to the loss of suitable habitat. Bell's vireo have been observed nesting at Van Norman Reservoir (7 miles southeast of the project area), and along the Santa Clara River east of Piru (about 18 miles northeast of the proposed project), but has never been observed in the South Fork of the Santa Clara River drainage.

5. The area from I 5 to approximately 400 yds upstream of the proposed debris basin was surveyed for suitable habitat for both Centrostegia and Hemizonia. No suitable habitat (i.e., sandy wash or rocky sandstone outcrops) and/or specimens of either species was found in this reach. The area from I 5 to Wiley Canyon Road was also surveyed and no suitable habitat for Hemizonia was found (sandstone outcrops do not exist in this reach). Centrostegia was also not found in this area. A thorough search was made in the area upstream of the proposed inlet structure (MFR 1 Oct 80). This area was sandier than the rest of the drainage but was still more like a streambed than a wash. No specimens of Centrostegia were found.

SPLPD-RP 19 June 1984

SUBJECT: Survey South Fork Santa Clara River Project Area for Existence of Centrostegia leptoceras, Hemizonia minthornii and Vireo bellii pusillus or Suitable Habitat

6. Due to the low amount of rainfall and warm spring weather, annuals bloomed relatively early this year and may have been missed. It is the opinion however of Ms. Lois Goodman that no suitable habitat exists in the proposed project area for either Centrostegia or Hemizonia.

7. Within the area surveyed only 1/2 acre of riparian habitat between I 5 and Wiley Canyon Road Bridge was found suitable for Least Bell's Vireo (MFR 7 Oct 80). A walk-through of the entire area was undertaken in an attempt to spot Bell's vireo or find nest and/or eggshells. No sign of Bell's vireo was found on this outing within the project area.

8. Following the field survey of the South Fork of the Santa Clara River, I contacted Lloyd F. Kiff, curator, Western Foundation of Vertebrate Zoology about California Least Bell's Vireo (telephone conversation record, 6 June 1984). He stated he has not seen or knows of anyone who has seen Bell's vireo in the Newhall area.

9. On 21 October 1980, Karen Helbrecht (Geographer, Corps of Engineers) and Sanford Wilbur (Biologist, U.S. Fish and Wildlife Service) surveyed the South Fork Santa Clara River project for California Least Bell's Vireo. No Bell's vireo were found at that time but Mr. Wilbur stated the area from I 5 downstream to Wiley Canyon Road crossing could serve as suitable habitat for two pairs of Bell's vireo. Subsequent field surveys of the area deemed suitable for Bell's vireo failed to establish its existence in the project area. Due to the failure to establish the presence of Bell's vireo in the project area, I believe the loss of this riparian habitat will probably not impact the Calfornia Least Bell's vireo.

1,3- Munz, Philip A., A Flora of Southern California University of California Press, 1974. P673 & P186

2 - Rancho Santa Ana Botanical Gardens-Type specimens Walter Wisura-Curator living Museum.

4- American Ornithologists' Union 1973. Checklist of North American Birds, 5h edition American Ornithologists Union, Baltimore, Maryland

WILLAIM PORTER
Ecologist
Environmental Resources Branch